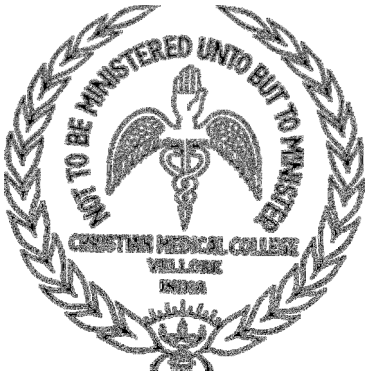

A CROSS SECTIONAL STUDY DONE TO DETERMINE THE PREVALENCE, DESCRIBE THE CLINICAL PROFILE AND INDENTIFY THE RISK FACTORS OF EPILEPSY IN CHILDREN WITH CEREBRAL PALSY (EPIC Study)

POST GRADUATE (MD Paediatrics) DISSERTATION

SUBMITTED TO

THE TAMIL NADU DR. MGR MEDICAL UNIVERSITY, CHENNAI

by

Dr. MURUGAN T. P.

DEPARTMENT OF PEDIATRICS

CHRISTIAN MEDICAL COLLEGE, VELLORE

OCTOBER 2017

CERTIFICATE

This is to certify that the dissertation titled "**A CROSS SECTIONAL STUDY DONE TO DETERMINE THE PREVALENCE, DESCRIBE THE CLINICAL PROFILE AND INDENTIFY THE RISK FACTORS OF EPILEPSY IN CHILDREN WITH CEREBRAL PALSY"** is the bona fide work done by **Dr. MURUGAN T.P.** under my supervision in the Department of Paediatrics, Christian Medical College and Hospital, Vellore, in partial fulfilment of the requirements for the degree of MD Paediatrics of The Tamil Nadu MGR Medical University, Chennai, to be held in April 2018.

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ABBREVIATIONS USED IN THE STUDY

AAN	**AMERICAN ASSOCIATION OF NEUROLOGY**
AED	**ANTIEPILEPTIC DRUGS**
CI	**CONFIDENCE INTERVAL**
CP	**CEREBRAL PALSY**
EEG	**ELECTRO ENCEPHALOGRAM**
GMFCS	**GROSS MOTOR FUNCTIONAL CLASSIFICATION SYSTEM**
IUGR	**INTRA UTERINE GROWTH RESTRICTION**
LAMI	**LOW AND MIDDLE INCOME COUNTRIES**
MRICS	**MRI CLASSIFICATION SYSTEM IN CEREBRAL PALSY**
PVL	**PERIVENTRICULAR LEUKOMALACIA**
SCPE	**SURVEILLANCE OF CEREBRAL PALSY IN EUROPE**
SES	**SOCIO ECONOMIC SCORE – (MODIFIED KUPPUSAMY 2012)**
SQ	**SOCIAL QUOTIENT**
VABS	**VINELAND ADAPTIVE BEHAVIOUR SCALE**
VLBW	**VERY LOW BIRTH WEIGHT**

ABSTRACT

Background:

Epilepsy is a common complication of cerebral palsy and occurs in about 15-60% of children with Cerebral palsy (CP).

Objectives:

To determine the prevalence of epilepsy, describe the clinical feature and identify the risk factors associated with presence of epilepsy in children with CP.

Materials and Methods:

439 consecutive children with CP aged between 1-15 years were recruited. Epilepsy was defined as occurrence of two unprovoked seizures 24 hours apart. Children with cerebral palsy who had epilepsy and those who did not have epilepsy were compared and analysed.

Association between epilepsy and the following were explored - history of neonatal seizures, socioeconomic status (assessed by modified Kuppusamy score), motor function (assessed by Gross Motor Function score - GMFCS), nutritional status (assessed by the weight for age Z score of WHO Multicentre growth reference study (MGRS), head circumference (HC) (Z score of head based on WHO MGRS), Social adaptive quotient obtained on the Vineland Adaptive behaviour scales and presence of abnormal neuroimaging findings using the MRICS (MRI function classification for cerebral palsy)

Results:

There were 169 children with epilepsy and the prevalence of epilepsy in the cohort was 38.5% (33.9 to 43.2 95% CI). The median age of onset of epilepsy in our cohort was 9 months (mean of 15.6 months) and majority (67%) of the children had onset of epilepsy in the first year. More than two thirds of the children had microcephaly, short stature and malnutrition in this study. Microcephaly was more significantly associated with children with epilepsy ($p<0.001$) but short stature or malnutrition was not significantly different between the children with epilepsy and children without epilepsy. Perinatal and neonatal complications were the important causes of cerebral palsy (CP) in this study. The predominant type of CP was spastic CP and among the spastic CPs, quadriplegic CP was the most common. The highest frequency of epilepsy in this study was in those with quadriplegia (49%), followed by mixed CP (44%) and then hemiplegic CP (33%). History of neonatal seizure is significantly associated with occurrence of epilepsy in CP ($p<0.001$) Family history of epilepsy is significantly associated with development of epilepsy. In our study we had found 94.7% children among epilepsy group had SQ below 70 score, compared to 67.8% in the non-epilepsy group ($p<0.001$). The prevalence of epilepsy increased with worsening of the GMFCS score ($p<001$)

Generalized seizures comprised 55%, myoclonic seizure (including infantile spasms) comprised 36% and partial seizure comprised 9% of the seizure patterns. Abnormal inter-ictal EEG was present in 68.6% of the children with epilepsy. Nearly half (46%) of the total patients with epilepsy had generalized epileptiform activities, 17% had focal epileptiform activities and hypsarrhythmia was observed in about 5%. The

remaining 31.4% had normal EEG. Seizures were controlled in 124 children (73.4%) Factors significantly ($p<0.05$) associated with poor seizure control were non-ambulant status (if the GMFCS score was 3 and above), abnormal EEG findings and polytherapy. Among the children who had MRI the predominant lesions were periventricular leukomalacia (36%), basal ganglia and thalamic lesions (23.8%) cortical and sub-cortical lesions (17.5%) and malformations (4.6%). Presence of certain co-morbidities namely visual impairment, swallowing difficulties and drooling and the presence of autistic symptoms were significantly higher in the children with epilepsy.

Conclusions:

Epilepsy is a common complication of CP and should be anticipated when there is history of neonatal seizures, microcephaly, poor social quotient or significant motor disability. Early identification and treatment may help in better control of seizures and improving the quality of life in CP children.

Keywords: Cerebral palsy, Epilepsy, Motor disability, Neonatal seizures, Risk factors

INTRODUCTION

Cerebral palsy (CP) is a well-recognized neurodevelopmental condition beginning in early childhood and persisting through the lifespan.[1] It was originally reported by the British Orthopaedic surgeon William Little in 1861. Little clearly indicated that the cause of the spasticity and paralysis was often damage to the brain during infancy, and was associated specifically to preterm birth and perinatal asphyxia. Other eminent medical minds of the past one hundred years including Sigmund Freud and Sir William Osler have also contributed important perspectives on the condition.[2]

In 1964, Bax provided the classic definition of CP which is widely used even today. He stated that CP is "a disorder of movement and posture due to a defect or lesion of the immature brain".[3] However Bax went on to state that "For practical purposes it is usual to exclude from cerebral palsy those disorders of posture and movement which are (1) of short duration, (2) due to progressive disease, or (3) due solely to mental deficiency". The 2004 International Workshop of Definition and Classification of Cerebral Palsy states that "Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour by epilepsy, and by secondary musculoskeletal problems".[2] Cerebral palsy is therefore, primarily a disorder of movement and posture caused by a static encephalopathy. However, even though the primary lesion, anomaly or injury is static,

the clinical pattern of presentation may change with time due to growth and the developmental plasticity and maturation of the central nervous system.

The aetiology of CP is diverse and multifactorial since the injury to the developing brain can occur in the prenatal, perinatal or postnatal periods. Common causes of CP include perinatal hypoxia, neonatal bilirubin encephalopathy, antenatal strokes, congenital brain malformations, infections and others. In most developed countries as much as 75% - 80% of the cases are due to prenatal injury and less than 10% are due to significant birth trauma or asphyxia.[4,5] So in Western cohorts, the most important risk factors are prematurity, perinatal strokes and prenatal brain malformations. And in the West, the risk of CP increases with decreasing gestational age and birth weight. There are few studies from India and these have shown that the aetiology of CP is quite different since the predominant causes are perinatal or postnatal. The major causes of CP in India are perinatal asphyxia, neonatal infections, very low birth weight and neonatal bilirubin encephalopathy.[6,7]

As mentioned in the current definition of CP that although CP is predominantly a motor disorder it is usually accompanied by many other co-morbidities - disturbances of sensation, perception, cognition, communication, and behaviours, by epilepsy, and by secondary musculoskeletal problems.[2] The Surveillance for Cerebral Palsy in Europe (SCPE) collaboration has reported that 31% of children with cerebral palsy (CP) have severe intellectual disability, 11% have severe visual disability, and 21% have epilepsy.[8]

The heightened risk of epilepsy in cerebral palsy (CP) was recognized by Freud more than 100 years ago.[2] Epilepsy is defined as the occurrence of at least two unprovoked

seizures occurring more than 24 hours apart.[9] It is one of the most common neuro-impairments in childhood and the prevalence of epilepsy in children ranges from 3.2-5.5/1,000 in developed countries and 3.6-44/1,000 in underdeveloped countries.[10] The prevalence of epilepsy in children with CP is much higher than the general population and occurs in 15 - 55% of children and adults with CP. If learning disability coexists, the risk to children with CP is much higher, rising to 71%.[11] On neuroimaging, more than 90% of CP children, have structural brain lesions, which is probably why epilepsy is common in CP. Epilepsy has been used as a marker of severity since it often worsens the quality of life of patients with CP.

Epilepsy in CP differs from epilepsy in non-CP individuals in the following ways:

i. The onset of epilepsy is usually earlier in children with CP. Studies have shown that occurrence of epilepsy in the first year of life is higher in CP children compared to the control group[12]

ii. The course of epilepsy in these CP patients is variable necessitating the use of more than one antiepileptic drug (AED)

iii. Neonatal seizures are more common in CP[13]

iv. Epilepsy in CP is more likely to remain drug-resistant (refractory) despite the use of multiple anti-convulsant medications[11]

v. Children with CP group are more likely to be on polytherapy as compared to the control group[7]

vi. Status epilepticus is many fold higher in children with CP

vii. Children with CP have lower seizure free interval frequency

viii. There is a higher risk of seizure relapse after AED discontinuation [14]

The above findings were evident in a study which compared patients with CP and epilepsy to those with epilepsy alone. Children with CP had a higher incidence of epilepsy with onset within the first year of age (47% versus 10%), history of neonatal seizures (19% versus 3%), status epilepticus (16% versus 1.7%), need for polytherapy(25% versus 3%), and treatment with second-line antiepileptic drugs (31% versus 6.7%)[15]

The prevalence of epilepsy in CP is also dependent on the degree of injury, the presence of co-morbidities and the type of CP. Data from various studies have shown that that children with spastic quadriplegia (50 to 94%) or hemiplegia (30%) have a higher incidence of epilepsy than patients with diplegia or ataxic CP (16 to 27%).[16] In dyskinetic CP it may be difficult to distinguish seizures from dyskinetic movements. In addition children with CP can have other paroxysmal disorders like breath holding spells which mimics epilepsy. Epilepsy in CP is also related to the intellectual performance and is more common among patients with intellectual disability[11].In patients with hemiplegia, the prevalence of epilepsy is significantly higher in those with more severe cognitive difficulties. Good prognostic factors for one year seizure free period in children with CP are normal intelligence, single seizure type, monotherapy and diplegic form of CP.[11] Children with CP and epilepsy are more likely to have abnormal neuroimaging findings compared to children with CP alone. Fifty-four percent of children with CP and an abnormal CT had epilepsy while only 27% of those who had a normal scan had epilepsy.[17]

Although both epilepsy and Cerebral palsy are not uncommon, there are very few Indian studies on Epilepsy in CP. In developing countries, including India, the

aetiology and the spectrum of cerebral palsy are different from those in the West. Hence, the type of epilepsy occurring in children with cerebral palsy is also expected to be somewhat different. This study was done to obtain the prevalence of epilepsy in CP and understand the various risk factors that affect the occurrence of epilepsy.

LITERATURE REVIEW

CEREBRAL PALSY:

The definition of cerebral palsy has four main components.[18–25]

a) CP is a disorder of movement and posture:

b) It results from an abnormality in the brain:

c) It is acquired early in life and

d) The condition is static at the time of recognition.

Although CP is predominantly a motor disorder, associated conditions like varying degrees of intellectual disability, improper speech and communication skills, presence and severity of epilepsy, the timing of brain insult and its anatomical site, presence and degree of sensory involvement, socio-economic factors and numerous other factors contribute to the overall outcome of the child. Thus no two children with cerebral palsy are the same and every child requires to be approached individually and the therapeutic approaches pertaining to their rehabilitation are unique.

Classifications of CP

A multi-disciplinary approach to management of CP has resulted in various classifications based on the vantage point of the care giver. For example the orthopaedic surgeon requires a definition of the limbs affected (with regard to spasticity or dystonia) and the functional abilities in terms of mobility, usage of limbs, contractures in order to direct treatment, whereas neurologists, developmental paediatricians and radiologists approach the disease from the causative point of view of the brain injury or brain malformation, which would help aid in predicting the

extent and severity of cerebral palsy. The physiotherapists would prefer a classification based on the topography, while the speech therapists would require a classification based on the abilities to communicate. From the parents point of view what is most important is the understanding of the overall functioning of the child, taking into account all the comorbidities and an idea of the future abilities/disabilities of the child in order to help them plan the therapy programs and make use of the educational resources.

Thus the complexity of the syndrome is clear from its various classifications; cerebral palsy can be defined according to the anatomical site of the brain lesion (cerebral cortex, pyramidal tract, extrapyramidal system, or cerebellum); clinical symptoms and signs (spasticity, dyskinesia [dystonic and choreo-athetoid forms], or ataxia); topographical involvement of extremities (diplegia, quadriplegia, or hemiplegia); timing of presumed insult (pre partum, intra-partum, or post-neonatal); and the degree of muscle tone (isotonic, hypotonic, or hypertonic).

1. **Classification base on the Topography**

The topographic classification of Cerebral palsy is based on the number of limbs involved and is classified as monoplegia, hemiplegia, diplegia, triplegia and quadriplegia.

Monoplegia: Monoplegic CP has isolated upper or lower extremity involvement. This has a mild clinical presentation.

Hemiplegia: This is unilateral paresis with upper limbs more severely affected than the lower limbs. Hemiplegic CP was seen in 17% of preterm infants and 56 % of term infants.[26] Pathogenesis is multifactorial and can include perinatal strokes, unilateral

brain malformations like schizencephaly, porencephaly, periventricular leukomalacia, encephalomalacia. Seizures can occur in more than 50% of hemiplegic CP children.[21]

Diplegia: Usually diplegia is associated with prematurity and low birth weight and the MRI shows periventricular leukomalacia. The lower limbs are predominantly involved and manifest with scissoring due to adductor tightness and toe-walking. Upper limbs are also involved.

Triplegia: Spastic triplegia involves three extremities. It usually involves both lower extremity and one upper extremity and has signs of spastic diplegia.[18,27]

Paraplegia: Only lower limbs are affected. The spasticity results in gait disturbances. This may masquerade as hereditary spastic paraplegia.

Quadriplegia: It is the most severe form of CP involving all four limbs. Trunk and upper limbs are most severely affected than the lower limbs. In term infants it is usually a consequence of severe acute intrapartum hypoxia which manifests as cystic encephalomalacia. In preterm infants the usual injury is extensive periventricular leukomalacia. Bilateral or extensive brain malformations can result in quadriplegia as well. There is spasticity of the limbs, truncal weakness, pseudo-bulbar palsy, sensory involvement and difficulties in feeding and swallowing.

2. Classification based on Neuromuscular deficit:

Depending on the neuromuscular deficits CP can be classifies as (i) spastic, (ii) hypotonic, (iii) dyskinetic which includes dystonic and choreo-athetoid (iv) ataxic and (v) Mixed (a combination of neuromuscular deficits)

Out of these types spastic cerebral palsy is the commonest and accounts for approximately 75% of all cases.

1) ***Spastic CP (Pyramidal):*** In this form of CP, pyramidal involvement with upper motor neuron signs (UMN) predominates. Thus weakness, hypertonia, hyperreflexia, clonus and positive Babinski sign are classically present. Contractures are common in spastic type of cerebral palsies.[21]
2) ***Dyskinetic CP (Extrapyramidal):*** Dyskinetic cerebral palsy mainly characterized by extrapyramidal involvement and movement patterns secondary to abnormal regulation of tone, defects in postural control and coordination deficits. The important clinical features are chorea, rigidity, chorea, athetosis, dystonia and ataxia. Contractures are uncommon in this type of CP. [21]
3) ***Mixed***: Mixed pattern of involvement is seen in 30% of cerebral palsy children and in this type both signs of spastic and extrapyramidal CP are present.

3. Classification based on the Gross motor functions – The Gross Motor Function Classification (GMFCS) system.

The GMFCS is by far the most comprehensive classification system used in CP and has been revised in 2007[28].The GMFCS describes movement ability of children with CP in one of five ordinal levels (Levels I to V). The GMFCS currently includes descriptions of children's abilities for each level across four age bands: before 2nd birthday, between 2nd and 4th birthday, between 4thand 6th birthday, between 6th -12th birthday and above 12th birthday. Briefly the gross motor movements are classified as follows (according to the abilities for each of the age bands):

LEVEL I: walks without limitations:

LEVEL II: walks with limitations:

LEVEL III: walks using a hand held mobility device.

LEVEL IV: self-mobility with limitations and may use powered wheel chair

LEVEL V: transported in a manual wheelchair.

4. **Surveillance of Cerebral Palsy in Europe (SCPE) Classification:**

A straightforward classification is needed that can be applied reliably by clinicians and used in registers. Such a classification (with categories of unilateral spastic, bilateral spastic, dyskinetic, and ataxic) and an associated decision tree was developed by the Surveillance of Cerebral Palsy in Europe (European network SCPE) and is now widely adopted.[24]

Prevalence of Cerebral Palsy

Despite advances in antenatal and perinatal care the overall prevalence of CP has remained stable in the past 40 years at 2-3· 5 cases per 1000 live births.[24,29] Prevalence is conversely connected with gestational age and birth-weight and varies from 90/1000 among extremely low birth weight infants (birth weights of < 1000g) to 1.5/1000 among babies with birth-weight of >2,500 g.

From studies around the world the prevalence is as follows.

- **Europe:** According to information obtained from a large database comprising more than 6000 children with CP children, obtained from 13 different regions of Europe, the overall prevalence of CP was 2.08/1000 between 1980 and 1990.[30]

- **USA:**A population-based American study reported that the prevalence of CP at eight years of age was 3.6 per 1000 children.[31]
- **Surveillance of Cerebral Palsy in Europe** (SCPE) which is an European collaborative network of cerebral palsy registers reported a prevalence of 72.6 per 1000 infants (who were alive at one month) among VLBW infants, compared to 1.2 per 1000 among infants of birth weights more than 2500 g.[8,33]
- **India:** There is only one population based from India and the prevalence of CP in less than 10 years children is believed to be about 2.27/1000.[34]

Cerebral Palsy in India

Two studies by Singhi in 2003 and 2012describe the aetiologies, clinical features and complications of CP in India.[6,7] Notable differences in her cohort compared to Western cohorts are:

- Higher proportion of children with quadriplegic CP in contrast to the higher proportion of diplegia in Western cohorts.
- However in India perinatal factors like perinatal asphyxia and neonatal factors like meningitis and kernicterus also contribute substantially to CP. The main causes were perinatal asphyxia, meningitis, neonatal sepsis, neonatal hypoglycaemia, neonatal hyperbilirubinemia, intracranial bleeds (associated with Vitamin K deficiency). The proportion of premature infants was much lower compared to Western studies. A much smaller contribution may be because of prenatal factors like cerebral dysgenesis and possibly chromosomal factors.

EPILEPSY IN CEREBRAL PALSY:

Epilepsy is a major manifestation of brain lesions – congenital or acquired and seizures are associated with severe brain injuries.[36] In addition to intellectual disability which is commonly seen in children with cerebral palsy, epilepsy is the most frequent single complication of CP. Epilepsy, like CP, is not a disease but a symptom of cerebral dysfunction, and so frequently coexists in the same patient. The coexistence of two disabling conditions is a double handicap to the child and a dual challenge for the managing medical and paramedical teams.[37] On neuroimaging, more than 90% of CP children,[38] have structural brain lesions, which is why epilepsy is common in CP. However, in a significant number brain injured patients, the seizures will not become clinically evident for months or years. This "silent period" after the initial injury indicates that in some cases the epileptogenic process involves a gradual transformation of the neural network over time.[39] Epileptogenesis is the process by which the previously normal brain is functionally altered and biased towards the generation of the abnormal electrical activity resulting in chronic seizures. Epileptogenesis progressively alters neuronal excitability, establishes critical interconnections, andperhaps requires intricate structural changes before the first spontaneous seizure occurs.[40] These changes are a result of neurodegeneration, neurogenesis, gliosis, axonal damage or sprouting, dendritic plasticity, blood–brain barrier (BBB) damage, recruitment of inflammatory cells into brain tissue, reorganisation of the extracellular matrix, and reorganisation of the molecular architecture of individual neuronal cells resulting in reverberating, or self-reinforcing, circuits.

Prevalence of Epilepsy in Cerebral palsy

Epilepsy is common in children with cerebral palsy (CP). Data from studies involving 1,918 children have found on average that about 43% of children with CP develop epilepsy.[16] In contrast the prevalence of epilepsy is only 0.5% in the general population.[41,42] Information obtained from a large population based database (Surveillance of CP in Europe – SCPE) showed that of the 9654 children with CP born between 1976 and 1998, 3424 (35%) children had a history of epilepsy.[43] In that cohort epilepsy was more frequent in children with a dyskinetic or bilateral spastic type and with other associated impairment.

In the study of 100 patients by Bruck *et al*[44] where patients were followed-up for 24 to 151 months (mean 57 months) the overall prevalence of epilepsy was 62%. Incidence of epilepsy was predominant in patients with hemiplegic and tetraplegic cerebral palsy.[45]

In a population based study of 204, 10 years-old children with cerebral palsy, at Atlanta the prevalence of epilepsy was 46%.[46] Follow up of a one-year birth cohort from the two northernmost provinces in Finland, detected that the, the total number of children affected with cerebral palsy (CP) was 69. Of these 48% had epilepsy at 14 years of age.[47]

In a study from Greece, a total of 178 consecutive patients with cerebral palsy and epilepsy were prospectively followed for 9.2 ± 2.4 years after onset of seizures and compared to a control group of 150 epileptic patients without cerebral palsy (median follow-up period, 10.5 years). The overall prevalence of epilepsy was 36.1%.[48] In a

study by Okumura, 31% of the children with cerebral palsy developed epilepsy by five years of age.[49]

Singhi *et al* from India studied a retrospective cohort of 452 CP children with epilepsy in which 160 (35.4%) had epilepsy.[6] In another cohort of 100 CP children from India in 56% of the patients had epilepsy.[50] In another study from Greece the incidence of epilepsy in 323 patients with cerebral palsy (CP) between the ages of 2-18 years was 41.8%.[51]

In a study in which EEG abnormalities were studied in 151 cerebral palsy patients from Saudi Arabia (79 boys, 72 girls age range 0.4-13 years) eighty-one children had seizures (53.6%) and 70 were seizure-free.[52] In a study from Hong Kong eighty-five patients (48 boys, 37 girls) with CP were recruited. Epilepsy affected 32 (37.6%) children with CP.[53] In a study from Israel sixty-five children out of 197 children (33.0%) with CP developed epilepsy.[54] In the study from Sweden done by Carlsson and associates of 146 children with CP, 55 (38%) had epilepsy by six years of age.[55]

In conclusion almost all cohorts from different parts of the world have shown consistently that the prevalence of epilepsy in Cerebral palsy is between 35% and 60%. The differences in the prevalence of epilepsy in CP depends primarily upon the presence of other co-morbidities like the topography, presence of intellectual disability, extent of the brain lesion and family history of epilepsy.

Age of onset of seizures

The age of onset of epilepsy in children with cerebral palsy is an important determinant in the long term prognosis, since it results in the need for more prolonged antiepileptic drug therapy and usually requires polytherapy.[56]

Most of the studies have shown that in majority of children, seizures start in the first year of life. Aksu found that the seizures started by two years of age in 50% children with cerebral palsy while in non-cerebral palsy children with epilepsy only 4% had onset of seizures within the first year.[57] Similarly Kwong and associates too, found that epilepsy in children with CP started earlier than in controls (epileptic children without CP). In their study 47% of the CP group developed epilepsy in the first year of age, compared 10% of the controls ($P < 0.05$).[53]

Bruck *et al* reported that the average age of the onset of epilepsy was 12.59 months, with the first seizure occurring during the first year in 74.2% of the patients.[45] In the study by Senbil, the age of onset was less than one year in 51% of the children.[56]

The age of seizure onset depends on the topography which usually correlates with the extent of the brain injury. Carlsson and team showed that the average of seizure onset was 6 months in children with quadriparetic cerebral palsy, 12 months in children with diparetic cerebral palsy, and two and half years in children with hemiparetic cerebral palsy. In another cohort of cerebral palsy children,[51] most patients with spastic tetraplegia had their first seizure in the first year of life but in children with spastic hemiplegia the onset of epilepsy was often delayed for several years. This study found that the median age of seizures in children with quadriplegia was six months; in diplegia was 12 months and 48 months in those with hemiplegia. Another study

showed that 60% of spastic tetraplegia patients developed epilepsy in infancy as opposed to 40% of those with other types of CP.[53]

In Singhi *et al'*s study the mean age of seizure onset was earlier in children with quadriplegia and diplegia (17.1 and 16.9 months) compared with children with hemiplegia (29.7 months). This study also reported that 61% of the children had their first seizure before 1 year of age and 15.2% had their first seizure between one and two years of age, and 12% of the children had their first seizure after two years. Only 7% children experienced their first seizure after 4 years of age. Moreover, the earlier the onset of seizures resulted in a greater frequency of seizures ($p < .01$).

In a study on children with hemiplegic CP following perinatal arterial stroke it was found that of the 34 of the 63 children who developed epilepsy, 41% developed epilepsy in the first year of life, 35% between one and five years and 23% between 8 and 13 years.[15] In the study by Zelnick, 49.2% of the children had their first seizures during the first 12 months and 69.2% had their first seizure during the first two years and additional 24% children had their first seizure between the second and sixth year of age and only 6.2% of the children developed epilepsy beyond 6 years. The mean age for seizures onset was 1.8 ± 2.0 years in this study.[54]

To conclude, children with spastic quadriplegia have earlier onset of seizures and in more than half of the children with CP, epilepsy started in the first year of life.

Topography of CP and its relation to Cerebral palsy

Epilepsy is an index of the severity of CP and brain damage is usually more severe when epilepsy occurs.[36] The frequency of epilepsy varies with type of CP. Data from

various studies indicate that children with spastic quadriplegia (50 to 94%) or hemiplegia (30%) have a higher incidence of epilepsy compared to patients with diplegia or ataxic CP (16 to 27%).[38] In patients with dyskinetic CP, it may occasionally be difficult to differentiate partial complex seizures from dyskinetic movements. Wallace[11] after reviewing various studies concluded that those cerebral palsies with cortical pathologies seemed are more likely to be complicated by epilepsy.

In a series of 146 CP children from Sweden the incidence of seizures according to the topography was as follows – 29.4% of those with hemiplegic CP, 35.6% in those with diplegic cerebral palsy, 100% in those with tetraplegic cerebral palsy, 35.7% in those with dyskinetic CP and 18.2% in those with ataxic CP.[55] In this study epilepsy was more prevalent in CP children who were born at term gestation as compared to those who were born preterm. This finding concurred with Zelnik's study which also showed that epilepsy was more frequent in CP children born full-term.[54] However other studies have shown differing results: Gul Mert reported that prematurity or low birth weight (less than 1500g) did not affect the incidence of seizures.[13]

In Bruck's cohort, there was significantly higher of incidence of epilepsy among those who were tetraplegic as compared to those with other forms of CP.[45] Gul Mert found significantly higher incidence in epilepsy in the spastic forms cerebral palsy (although there was no differences between the various spastic types), compared to those with dyskinetic cerebral palsy.[13]

Singhi *et al* reported the incidence of epilepsy among patients with hemiparetic cerebral palsy (65.9%) and those with quadriparetic cerebral palsy (42.6%), was

higher when compared to those with diplegia (15.8%).[58] They account these differences in incidences due to the involvement of the cortical involvement and severity of brain damage seen in hemiparetic and quadriparetic patients. In diparetic CP the brain damage mainly involves the periventricular white matter and spares the cortex.

Hadjipanayis *et al* reported a predominance of epilepsy those with quadriplegia and hemiplegia.[59] In a Japanese study, Sugiura *et al* had showed good association exists between tetraplegia and with age-dependent epileptic encephalopathy.[60]

The large longitudinal study from the SCPE, showed that in those with Unilateral spastic CP, 22.8% of those who were ambulant had epilepsy (517/2267) compared to 68.8% in those who were non-ambulant (53/77). Among children with Bilateral Spastic CP, 15.9% of those able to walk alone had epilepsy compared to 60.1% of those who were unable to walk.[43]

To sum up most studies have shown that seizures are most common in children with quadriplegia, and this is directly linked to the extent of brain damage.

Effect of socio-economic status.

Sundrum *et al* has shown a linear association between risk of cerebral palsy and socioeconomic status (SES) in Western populations.[61] A meta-analysis of studies done in high income Western societies showed that childhood disabling chronic conditions were strongly associated with low SES. Psychological disorders and intellectual disabilities are among the most common and intractable conditions. The odds of these being reported among low SES households are around twice those for high SES

households. This review also showed significant association between of cerebral palsy [Odds ratio 1.42 (95% CI 1.26 to 1.61)] and epilepsy [OR1.38 (95% CI 1.20 to 1.59)].[62] Another study done in California showed that Black infants (who generally are from families with lower SES) have an increased risk of cerebral palsy when compared with white infants predominantly because of the higher incidence of low birth weight babies among Blacks.[63]

However in Low and Middle Income (LAMI) countries due to the paucity of well-designed longitudinal population based studies the relation between socio-economic status (SES) and the risk of cerebral palsy is not clear. This was brought out by a systematic review which looked at childhood disability and socio-economic indicators in LAMI countries. The authors concluded that despite socially and biologically plausible mechanisms underlying the association of low household SES with childhood disability in LAMI countries, the empirical evidence from quantitative studies was inconsistent and contradictory. There is evidence for a bidirectional association of low household SES and disability and longitudinal data is needed to clarify the nature of this association.[64]

Low birth weight and prematurity are the strongest risk factors for cerebral palsy.[65] Given the observed association between these factors and SES, an increased prevalence of cerebral palsy with low SES is expected.[61] This may be particularly true in India with its high levels of poverty and lower maternal education both of which are strongly associated with low birth weight and IUGR status.

Neuroimaging of Cerebral Palsy

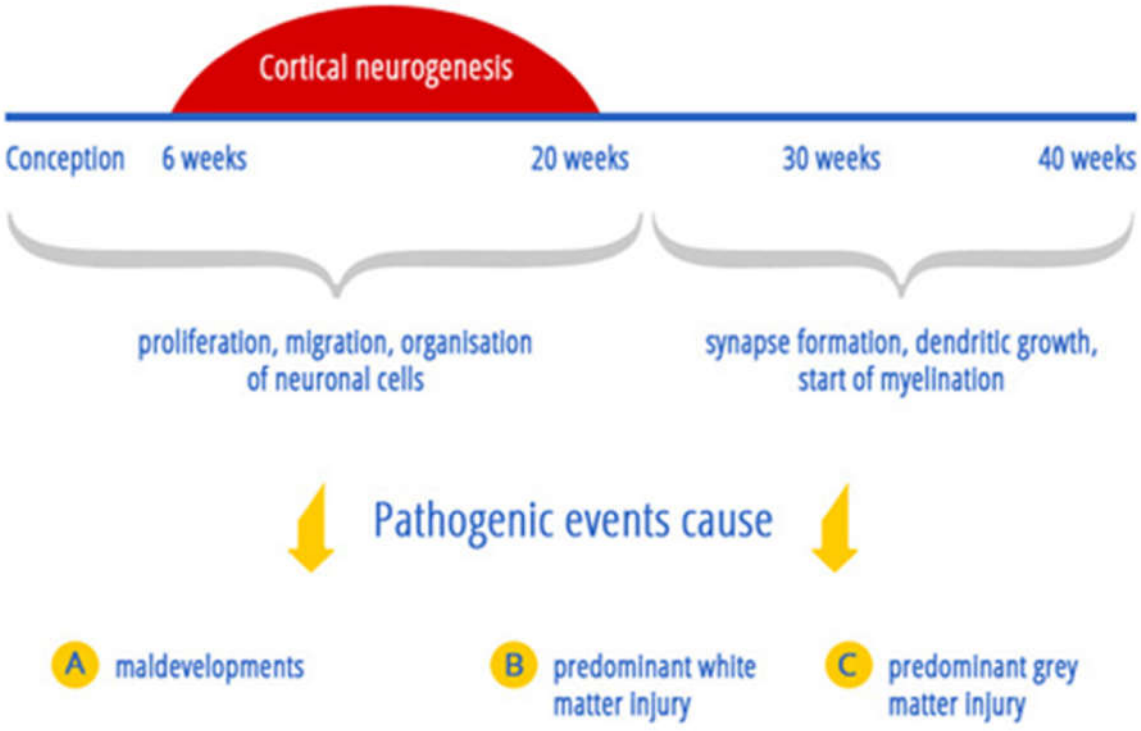
CP is a clinical diagnosis, based upon neurological symptoms of a motor disorder causing activity limitations.[66] However the aetiology of CP can be determined in many patients based on the results of neuroimaging in combination with the clinical history. Currently the American Association of Neurology (AAN) advises neuroimaging (MRI or CT) in the evaluation of a child with CP. MRI, when available, is preferred to CT scanning because of the higher yield of suggesting an aetiology and timing of insult leading to CP.[16]The yield of finding an abnormal MRI scan in a child with CP is very high (average of 89%) and greater than that reported using CT (77%).[67–69] The yield on MRI (as with CT) also depends on the type of CP that is present. MRI is more likely to be abnormal in cases of CP associated with prematurity, showing abnormalities such as periventricular leukomalacia, compared to infants born at term.

CP comprises underlying aetiologies which occur at different stages of brain development. Pathogenic events affecting the developing brain can cause lesions or mal-developments which result in cerebral palsy. Not surprisingly, there is massive diversity in the clinical manifestations of CP.

During the 1st and 2nd trimester of pregnancy, cortical neurogenesis is a predominant factor in brain development, characterized by proliferation, migration and organization of neuronal precursor cells, then neuronal cells. Brain pathology in this period is characterized by mal-developments. During the 3rd trimester and in the neonatal period, when the "gross architecture" of the brain (neural cyto-and histogenesis) is established, growth and differentiation events are predominant, which

persist into post-neonatal life (axon, dendrite and synapse formation, myelination). Disturbances of brain development in this period result in lesions in the white matter (Figure 1). During early 3rd trimester periventricular white matter is more affected and towards the end of gestation, cortical and deep grey matter become more vulnerable.[70]

Figure1: Brain development, pathogenetic patterns and timings[71]



Based on the above patterns of MRI in CP, recently a new classification of MRI patterns has been proposed – the MRI classification system (MRICS) for children with cerebral palsy.[72]

Table 1: The MRI classification system (MRICS) for children with cerebral palsy

Mal-developments
A.1. Disorders of cortical formation (proliferation and/or migration and/or organization
A.2. Other mal-developments (examples: holoprosencephaly, Dandy–Walker malformation, corpus callosum agenesis, cerebellar hypoplasia)
B. Predominant white matter injury
B.1. PVL (mild/severe)
B.2. Sequelae of IVH or periventricular haemorrhagic infarction
B.3. Combination of PVL and IVH sequelae
C. Predominant grey matter injury
C.1. Basal ganglia/thalamus lesions (mild/moderate/severe)
C.2.Cortico-subcortical lesions only (watershed lesions in parasagittal distribution/ multicystic encephalomalacia) not covered under C3
C.3. Arterial infarctions (middle cerebral artery/other)
D. Miscellaneous (examples: cerebellar atrophy, cerebral atrophy, delayed myelination, ventriculomegaly not covered under B, haemorrhage not covered under B, brainstem lesions, calcifications)
E. Normal

.

The varying patterns of findings were clearly brought out in a large study of from the Victorian CP Register Victoria [45] which analysed the post neonatal MRI of 594 CP children the MRI patterns of CP were as follows: White matter injury was the most common MRI pattern (45%), followed by grey matter injury (14%), normal imaging (13%), malformations (10%), focal vascular insults (9%), and miscellaneous patterns (7%).

Neuroimaging has consistently showed the children with abnormal neuroimaging findings are more likely to have CP. In the study by Bruck and colleagues normal CT

findings were recorded in only 9 from 57 patients with CP and epilepsy[45]. Gul Mert *et al,* found MRI abnormalities of about 86.7% in their group of CP children with epilepsy.[13] In their study abnormality on the MRI did not significantly affect epilepsy development or prognosis. Kulak reported that abnormal neuroimaging was significantly related to increases in epilepsy development in cerebral palsy.[73]

In the study by Gururaj *et al*, 96% of children with CP and epilepsy had abnormalities on their MRI /CT like significant brain volume reduction, periventricular leukomalacia (PVL), basal ganglia changes, multicystic encephalopathy and schizencephaly. This is in contrast to their control group of children with epilepsy without CP in whom 81% the neuroimaging was normal.[74]

In the study by Carlsson (in which 49 of 54 children had MRI or CT and 5 children had neuro-sonogram) it was found that children with CNS malformations or a grey matter damage had higher incidence of epilepsy than cerebral palsy children with white matter damage or of unknown aetiology.[55]

Yin et al found that the neuroimaging findings differed depending upon the timing of the event. White matter hypoplasia and cortical malformations were associated with earlier insults, whereas patterns of hypoxic ischaemic encephalopathic damage predominated when the insult was in the latter part of pregnancy.[67] Sugiura found that children with cerebral cortical lesions demonstrated by radiological evidence had more increased incidence of epilepsy.[60]

In the study by Okamura et el looked at the epilepsy in spastic CP, congenital anomalies were present in 9.2% of the patients (lissencephaly, pachygyrias, focal cortical dysplasias, Dandy Walker malformation and two children with unclassifiable

anomalies).[49] Perinatal injury was present in the remaining 91% of the patients. These included periventricular leukomalacia, post-haemorrhagic porencephaly, full-term type border-zone infarct, bilateral basal ganglia-thalamic lesion, subcortical leukomalacia and multicystic encephalomalacia. Epilepsy developed in 50% of the patients with congenital anomalies and in 26% of those with perinatal injury by 5 years of age. In this study the percentage of patients with epilepsy was also high among those with term type injury as compared to those with preterm injury.

In the study by Singhi et al on 105 CP children with epilepsy, CT was abnormal in 61% of the children. CT findings were most common in those with hemiplegia and diplegia (75% each) while it was abnormal only in 57.4% of children with quadriplegia. Periventricular leukomalacia was the commonest finding those with diplegia, while porencephalic cysts, infarcts and cerebral atrophy was seen in the children with hemiplegia. In this study epilepsy was most common in hemiplegia (65.9%) and in quadriplegia (42.6%), and least among those with diplegia (15.8%)[75]. This could be explained by the fact that children with quadriplegia and hemiplegia have more severe brain damage.

In the study by Zelnik, abnormal imaging was more common in CP children with epilepsy as compared to children without epilepsy ($p< 0.003$). Children with infarcts and grey matter disease were somewhat more prone to develop epilepsy, while children with white matter disease were relatively more frequent in the group of CP without epilepsy.[54]

Cooper and her colleagues from the Victorian CP registry looked at 166 CP children with white matter injury. They found that, 25% of children with CP and WMI had

seizures, and 15% had epilepsy. The frequency of febrile seizures and epilepsy, and the proportion of children with febrile seizures who went on to develop epilepsy, were greater what is reported than are reported in the general population.[76]

Another study from the Victorian CP registry looked at children with hemiplegic CP following perinatal arterial stroke it was found that 54% developed epilepsy over the period of follow up.[77]

To conclude neuroimaging abnormalities are extremely common in children who have CP with epilepsy. Quadriplegics and hemiplegics are more likely to have cortical brain damage which predisposes to seizures. Since cortical damage is more often seen in term babies compared to preterm babies, the former are more likely to have seizures.

Neonatal seizures and subsequent epilepsy

Neonatal seizures is an important predictor for epilepsy in children with cerebral palsy and most studies have shown that majority of the children who have neonatal seizure go on to develop epilepsy.[36,78]

In a study which reviewed infants with neonatal seizures who were enrolled in the Collaborative Perinatal Project and followed up from birth to seven of age it was found that, of the 181 survivors, 13% had cerebral palsy, 19% had an IQ less than 70, and 20% had epilepsy and 13% had a combination of mental retardation, cerebral palsy, or epilepsy.[78] Another study from the same cohort which looked at the factors which predicted CP showed that a children with neonatal seizures who had need for resuscitation beyond five minutes of birth had a 78% chance of developing CP.

Prediction of mental retardation and epilepsy after neonatal seizures could be correctly performed in 64-83% of cases.[79]

In the study by Kwong and associates the incidence of neonatal seizures were higher in the group of children with CP with epilepsy as compared to the control group (19% vs. 3%)[53]. In the study by Bruck et al,48.4% of the children with epilepsy had neonatal seizures compared to 8% in the control group (p=0.004).[45] In the study by Senbil, 29% of the CP children with epilepsy had history of neonatal seizures.[54]

Neonatal seizure is a good predictor of subsequent epilepsy and is also a good prognostic indicator. In the study by Zelnik, twenty-seven children of total of 197 children (13.5%) with CP had documented neonatal seizures. Twenty-two of them (81.5%) subsequently had epilepsy, [OR 12.99, 95% CI (4.64–36.43), $p < 0.001$]. Most of the children who had neonatal seizures went on to have quadriplegic CP or hemiplegic CP.[54]

In the study by Carlsson and associates, neonatal seizures were reported in 31% (45 of 146) of the children. The risk of developing epilepsy was significantly increased when neonatal seizures occurred (OR of 2.25).[12] Neonatal seizures were strongly associated with perinatal intracranial haemorrhage, HIE and perinatal CNS infections.

Gul Mert and colleagues found that the risk of epilepsy development 8 times (95% confidence interval [CI] 1.73-37.1) greater in children who had neonatal seizures compared to those who did not have history of neonatal seizure. Patients with neonatal seizure history were 3.3 times more likely to have poor prognosis with regard to epilepsy control compared to those who had no neonatal seizure history.[13]

In Gururaj's study neonatal seizures were significantly higher in the group of children with CP and epilepsy compared to those with CP and without epilepsy (43% vs.29%). In this study the other control group of children who had only epilepsy had no history of neonatal seizures[80]. Levene *et al*, indicated that neonatal seizure history is a poor prognostic factor for cognitive, behavioural, and epileptic complications.[81]

Although neonatal status epilepticus was previously reported as a significant predictor of later epilepsy in term infants who experienced neonatal seizures, it remains uncertain whether long-lasting seizures in infants actually cause later epilepsy, or whether they are mere epiphenomena of some underlying epileptogenic state. Nevertheless, evidence from animal studies supports the principle that long-lasting seizures can permanently disrupt neuronal development, induce synaptic reorganization, and produce a reduction in the threshold for later seizures.[82]

Status epilepticus in Cerebral Palsy

Status epilepticus is common in childhood epilepsy, and children are at highest risk in those with a prior neuro-impairment.[83,84] Therefore there is a higher incidence of status epilepticus associated with epilepsy in cerebral palsy. Status epilepticus occurred in 47% of the children with cerebral palsy in the study by Carlsson. As a comparison, among those with epilepsy (with or without CP, and of all ages), between 1% and 16% are reported to have had convulsive status epilepticus,[36] In the study by Kwong, status epilepticus affected 16% of the children with CP but only 1.7% from the control group (epileptic children with normal neurodevelopment status) ($p< 0.05$).[53] Status epilepticus occurred in those with more severe brain damage like tetraplegia.

Family history predisposing to Epilepsy

The presence of family history of epilepsy increases the risk of seizures in children with CP. In a study involving patients who were attending a seizure clinic, epilepsy was present in 16% of first-degree relatives of those with CP.[57] Another study found that family history of epilepsy was associated with a 5.5 times higher risk of epilepsy among children with cerebral palsy children as compared to controls.[13] In the study by Bruck, the children with cerebral palsy who had epilepsy had a much higher incidence of family history of seizure disorder (29%) as compared to the non-epileptic controls (who had family history in 2% of the cases).[45] In the study by Curatolo, children with CP were 17 times more likely than controls to have a first-degree relatives with seizures.[85]

However other studies have found that family history of seizures do not predispose to epilepsy in CP children. In the study by Kwong, family history of seizures was not associated with epilepsy (both the CP children with epilepsy and the non-CP children with epilepsy had a family history of seizure in 2% of the cases)[53]. Wanasinghe in her study on epilepsy in children with hemiplegic CP secondary to perinatal arterial stroke did not find any association with family history of seizures.[77]

Seizure semiology and EEG abnormalities in CP children with epilepsy

EEG abnormalities observed in 66-92.6%of the patients with cerebral palsy. Although epilepsy in common in children with CP, studies have not shown any evidence that EEG is useful in determining the aetiology of child's CP. Neither is there any evidence to recommend that EEG should be done to screen for epileptiform abnormalities.[16] However, in the presence of associated seizures, it is essential for the

electrical characterization of the seizure discharge. Studies have shown that children with CP are liable to experience many types of seizures and epilepsy syndromes. Although EEG is a very important adjunct to the diagnosis of epilepsy it has its limitations. In children with CP, EEG may be abnormal when there is no history of clinically recognizable seizures. In children who have definite epileptic seizures at other times, it may show epileptic spikes when there are non-epileptic involuntary movements which relate to the CP. If the focus of origin for the seizures is far from the external surface of the brain, for example in the inferior frontal region, inter-ictal, and sometimes ictal, discharges may not be captured on an EEG recorded from the scalp.[11] Furthermore inter-ictal epileptiform activity need not be confined to the affected hemisphere in hemiplegic CP. There is also evidence that abnormal EEGs in children without CP have been correlated with poor cognitive or behavioural functioning.[11]

There are conflicting reports on trying to correlate the type of CP with the EEG patterns. One series showed that partial seizures were common in hemiplegic CP, while another suggested that generalized epilepsy were more likely to be present. The other forms of seizures which are reported include myoclonic seizures, West syndrome and mixed forms of seizures.[58]

In a study by Al Suleiman who looked at the EEG patterns of 151 children with cerebral palsy, 81 of whom had seizures and 70 without seizures, the findings were as follows: In the children with seizures generalized slow waves were seen in 44%, Epileptiform activity was seen in 81 % (of these 73% were generalized, 18% were focal and 9% was multifocal), hypsarrhythmic pattern/burst suppression pattern was

found in 6% and the EEG was normal in 7.4%. In the non-epileptic CP children 39% had epileptiform discharges, hypsarrhythmic pattern in 4% and normal EEG in 34.2%. Thus the frequency of EEG abnormalities was higher in the children with epilepsy than in the non-epilepsy group.[52]

In another study by Senbil and colleagues comparing epileptic and non-epileptic cerebral palsy, it was found 90.3% of epileptic patients had abnormal EEG compared to 39.5% of the non-epileptic patients ($p<0.001$). This study found that the incidence of generalized slowing, generalized and focal epileptiform activity was significantly higher in the group with epilepsy. However, there was no difference in hypsarrhythmia and burst suppression between the two groups. In this study 54% had generalized seizures, 16.1% had myoclonic seizures, 6.5% had infantile spasms and the remaining 22.5% had focal and other forms of seizures.

In the study by Bruck *et al***,** 61.8% of the children had generalized epilepsy and 27.8% had focal epilepsy. Infantile spasms and other forms of seizures contributed to the remaining 10%[45]. In the cohort followed up by Carlsson and associates majority (60%) of the children had both mixed forms of seizures (partial and generalized). Only generalized seizures was seen in 23.6%, only partial in 16.4% and infantile spasms in the remaining 14.5% of the children.[12]

In the study by Singhi *et al*, generalized seizures was seen in 38.1%, partial seizures (simple and complex) was present in 21%, myoclonic jerks in 14.3% and infantile spasms in 22% of the children. The EEG was abnormal in 70.5% of the children with epilepsy.[75] Slowing was most often seen in children with quadriplegia and hemiplegia.

Most of the children with quadriplegia and diplegia showed generalized abnormality. Almost half of the children with hemiplegia showed focalepileptiformabnormalities.[86] A study from the Victorian CP data base done on a cohort of 166 children who had white matter injury it was found that 41 (25%) had epilepsy. Four children had West syndrome which resolved with treatment. Thirty children had focal epilepsy with seizure manifestations and EEG discharges typical of early-onset childhood occipital epilepsy or childhood epilepsy with centro-temporal spikes. Two children had generalized epilepsy Fourteen children had evolution from one epileptic syndrome to another.[76]

To conclude EEG abnormalities are common in children with CP who have epilepsy. However, the findings are varied and on many occasions the ictal and inter-ictal EEG findings may not with clinical features. Besides seizures, epileptiform activities are associated with behaviour and cognition in CP children.

Intellectual disability and epilepsy in Cerebral palsy

Intellectual disability is a common accompaniment of Cerebral palsy and epilepsy. In a national survey in the US, it was found that 12.1% of the children with CP have intellectual disability.[87] Although there are no longitudinal population based studies in India two reviews of children with cerebral palsy from a tertiary institute showed that the prevalence of ID was 38% in one study and 72.5% in the other study. It is also known that intellectual disability depends upon the extent of the brain injury which is manifested by the topography. Children with spastic quadriplegia have greater degrees of mental impairment than children with spastic hemiplegia. Intellectual impairment

in children with CP is strongly associated with the presence of epilepsy or an abnormal EEG, or an abnormal neuroimaging.[16] Whether epilepsy is the cause of a low IQ in CP or an indicator of the more widespread injury resulting in both epilepsy and a low IQ is impossible to disentangle. CP arises from a cerebral lesion, including cortical lesions, some of which are highly epileptogenic, for example those in the temporal and frontal lobes; a refractory epilepsy always worsens the cognitive (and frequently also the motor) prognosis in CP.[43] Vargha-Khadem *et al* reported that, in patients with hemiplegia, the presence of epilepsy is clearly associated with more severe and increasing cognitive difficulties.[88] Sussova *et al* also reported that 63% of their hemiplegic patients were mentally retarded as compared with 16% of non-epileptic patients .Kwong and colleagues also concluded even in the same form of CP such as hemiplegia, mental sub-normality was more common in children with epilepsy than in those without epilepsy. [53]

In the study by Carlsson and colleagues the frequency of epilepsy increased with decreasing level of cognitive function ($p<0.001$).[12] Nineteen per cent (15 of 80) of children with CP and normal cognitive function had epilepsy, compared with 61% (40 of 66) of those with mental retardation. In Gul Mert's study it was found that the risk of moderate or severe intellectual disability in CP children with epilepsy was 4.02 times higher than the CP children without epilepsy.[13]

In Singhi's cohort those with intellectual disability had an earlier onset of epilepsy, more difficult to control seizures, more frequent seizures and more severe seizures. In those with moderate to severe mental retardation, more than half had daily seizures, and in only 49.2% could they be controlled as compared to seizure control in more

than 60% of the controls. Also, patients with quadriplegia had a significantly higher intellectual disability than other groups ($P < .05$)[58]. Other studies have also shown that CP associated with epilepsy is far more frequently accompanied by mental retardation than CP without epilepsy.[36,89]

Polytherapy in epilepsy of Cerebral palsy

Polytherapy is common in treating epilepsy in children with cerebral palsy and many studies has shown poorer resolution of seizures in children who are on polytherapy.

In Gul Mert's cohort, although there was good control of epilepsy in cerebral palsy children, about a quarter of them were receiving polytherapy and these children had significantly poorer prognosis for remission.[13]

Gururaj found in his study that children with spastic tetraplegia more often required polytherapy.[56] In Kulak *et al*'s cohort, polytherapy was commonly (59.5%)used in children with spastic tetraplegia.[73] Polytherapy was used in about only in one third of the children in Kwong's study group,[53] which is a lower figure when compared with 82% reported by Aksu *et al*.[90] However this could partly be due to the fact that in Kwong's group new anticonvulsants were used in a significant proportion of the patients.[53]

Seizure outcomes in Cerebral Palsy

Epileptic seizures associated with brain damage are generally difficult to control.[36] Only about half the individuals with epilepsy and neurologic deficits can be successfully treated with AEDs in the long term.[91,92] A good outcome (seizure free of more than1 year) has been reported in 38% to 67% of children with CP and

epilepsy.[44,51,53] Children with CP due to CNS malformation, CNS infection, and grey matter damage had significantly less chance of a good seizure outcome than those with CP due to white matter damage or with unknown aetiology.[22,55] Jacobs *et al* reported that the epilepsy prognosis was better in patients with extrapyramidal forms of cerebral palsy.[13]

Intractable epilepsy is defined as uncontrolled seizures occurring with an average frequency of at least one seizure per month over an observational period of 2 years or more, despite treatment with at least three different anticonvulsants, administered singly or in combination[93] Kwong reported intractable epilepsy in 22% of their patients.[53] In this study the three most salient early predictors of seizure refractoriness were high initial seizure frequency, abnormal neurodevelopmental status, and breakthrough seizures early in the course of treatment. Other important risk factors for intractable epilepsy, were history of CNS infection and perinatal hypoxic-ischemic encephalopathy. Kwong also described that children with spastic diplegia tend to have better outcome, whereas children with spastic tetraplegia are associated with poor seizure control.

Another study showed that the overall prevalence of intractable epilepsy was 51.2%, while in spastic tetraplegia it was even higher (60%).[73] Epilepsy was controlled in 83.3% of spastic diplegia and in 72.7% of spastic hemiplegia children. However, given the symptomatic nature of most seizures associated with CP, it is encouraging to note that remission can occur, even in those with very severe disabilities. In about 30% of those with bilateral spastic CP, or hemiplegia, epilepsy was likely to become inactive.[11]

It has been observed that in patients with cerebral palsy and epilepsy, as the uncontrolled seizure period extends, the prognosis becomes poorer and the patients who likely to have resistant seizures.

AIMS AND OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVE:

1. To obtain the prevalence of epilepsy in a cohort of children with cerebral palsy

SECONDARY OBJECTIVES:

2. To identify risk factors for in epilepsy in children with cerebral palsy
3. To describe the clinical profile of the CP children with epilepsy in comparison to CP children without epilepsy

MATERIALS AND METHODS

STUDY DESIGN

A cross sectional study of children with cerebral palsy

SETTING

The study was conducted in the Outpatient Department of the Developmental Paediatrics OPD, Christian Medical College (CMC) hospital, a tertiary level referral hospital.

The study started on 1/1/16 and subjects were recruited till 28/3/17 (15 months)

PARTICIPANTS:

All children with Cerebral Palsy who were 12 months above and who consulted with the senior consultant (Dr. SPO) in the above time period were recruited consecutively. The children were subsequently separated into two groups – Group A: children with CP with epilepsy and Group B: Children with CP without epilepsy.

OUTCOMES:

The primary outcome was the presence of Epilepsy in the children with cerebral palsy.

Epilepsy was defined as two or more unprovoked seizures on two separate occasions.

Cerebral Palsy was defined as the presence of motor dysfunction caused due to non-progressive of non-progressive damage to the developing brain. The upper limit considered for "developing brain" was 2 years. Therefore, non-progressive cerebral

lesions resulting in motor dysfunction occurring after the age of 2 years were not considered.

DATA SOURCES:

Detailed history was obtained and a complete clinical examination, including neurodevelopmental assessment, was done. The following details were recorded on a pre-structured proforma and the data was subsequently entered into EPIDATA database:

- Demographic information of both groups was recorded from the parents and included details of socio-economic status, mother's antenatal history, labour and delivery, details of birth, birth weight, gestational age, immediate and later neonatal period, developmental history, details of seizures including type of seizure, age at onset of seizure, provoking factors history of neonatal seizures, treatment and response to anticonvulsant medications, of birth, parental consanguinity, and family history of epilepsy. Socio-economic status was assessed using the Modified Kuppusamy Score
- After the physical and neurologic examination was done the following were recorded in the proforma: anthropometry, details of cerebral palsy - aetiology of cerebral palsy, the type of cerebral palsy,
- The level of motor involvement assessed using the GMFCS scoring.[28]
- The social quotient assessed with the help of a clinical psychologist using the Vineland Adaptive Behaviour scales (VABS). To maintain objectivity and

uniformity of measurement across the entire age range of children, the VABS was used for measuring the social quotient. [94]

- Particulars about the occurrence of seizures – type, duration, treatment details, complications, seizure control

EEG: A 10-channel EEG device was used for the recordings, and the electrodes were used according to the international 10-20 system. The recordings were obtained while younger children were in spontaneous or sedated sleep and the others were awake. Bipolar and reference montages were used. The recordings were examined for background activity and pathologic activities. Only spike or spike-wave activities were regarded as epileptiform activity. EEG findings were reported by qualified neurologists.

As recommended by the American Association of Neurologists Practice Parameters, interictal EEG was done when the "child with CP has a history or examination features suggesting the presence of epilepsy or an epileptic syndrome" [16]

- **Neuroimaging (CT or MRI or Both)**

  Neuroimaging was planned for all patients with GMFCS Level II and all children with GMFCS I who had seizures. Neuroimaging was done in some children with GMFCS Level I without seizures. Neuroimaging findings were interpreted by Neuroradiologists. Neuroimaging finding were classified as per the MRI classification system (MRICS) described by Himmelman et al.[72] (table 1, page 22)

INCLUSION CRITERIA

All the children aged 12 months and above who had Cerebral palsy were recruited consecutively

EXCLUSION CRITERIA

The following children were not enrolled

- Children known to have progressive neuro-metabolic or neurodegenerative encephalopathy,

CLASSIFICATION OF CEREBRAL PALSY

Cerebral palsy was classified as

Spastic Quadriplegia: Spasticity of limbs on both sides

Spastic hemiplegia: Spasticity of limbs on one side

Spastic diplegia: Spasticity of all four limbs with lower limbs more involved than upper limbs

Dyskinetic: Varying muscle tone in the limbs. Dyskinetic was further classified as

a. **Dystonia:** Tone generally increased with decreased activity
b. **Choreo-athetotic:** Tone generally decreased with increased activity

Ataxic: Decreased tone with ataxia not attributable to weakness, spasticity, dystonia, or choreo-athetosis

Mixed CP: A combination of the above categories.

OUTCOME MEASURES

Presence of Epilepsy in children with Cerebral palsy was considered the outcome of the study.

STATISTICAL METHODS

Calculation of sample size

The sample size is calculated based on a similar study by Kwong K et al in which the prevalence of epilepsy in CP was about 38% (Table 2)

Table 2: Sample size calculation

Sample size calculation (using N-Master software)

Single Proportion - Absolute Precision			
Expected Proportion	0.38	0.38	0.38
Precision (%)	5	6	7
Desired confidence level (1- alpha) %	95	95	95
Required sample size	**362**	251	185

Sample of **362** is needed to estimate the prevalence of epilepsy in CP with 5 % precision and 95% confidence interval.

. Kwong, K. L., Wong, S. N. & So, K. T. Epilepsy in children with cerebral palsy. *Pediatr. Neurol.* **19,** 31–36 (1998).

STATISTICAL PROCEDURES USED FOR THE STUDY

- Data was collected on a proforma and the information entered into the EPIDATA database. All the risk factors were defined using standard definitions obtained from

renowned textbooks. The operational definitions of each variable are presented in the "Appendix section".

- The prevalence of the outcome (epilepsy) is presented with 95% confidence interval.
- Variables are summarized with descriptive statistics (mean, median in cases where the distributions are not normal & standard deviations).
- Categorical measurements were analysed as number and percentage and continuous measurements were analysed as mean and standard deviation (median and minimum-maximum where necessary).
- The chi-square test was used for comparison of categorical measurements.
- Student t-test was used to ascertain the significance of differences between mean values of two continuous variables and Mann–Whitney test was for non-parametric distribution.
- Univariate analysis was done to explore the relationship between various risk factors and the outcome epilepsy. Chi-square analysis was used to test for differences in proportions of categorical variables between two or more groups. Where the sample size was small the Fisher exact test (two-tailed) was used instead of Chi-square test.
- Actual p-values were reported.
- P-values of <0.05 were considered significant on bivariate analyses and the associations were explored further using step-wise multivariate logistic regression analysis. The final model was one in which the predictors remained in the model if the p-value was <0.05.

- Model assumptions and fit were evaluated using Hosmer and Lemeshow Goodness of Fit statistics and p-value of >0.05 was considered as good fit. The best model is presented with adjusted Odds ratios and 95% CI.
- All analyses were done using the SPSS package 16.0 (SPSS Inc., Chicago, IL, USA).

BRIEF DESCRIPTION OF THE SCALES USED IN THE STUDY

1. Gross Motor Functional Classification Staging[28]

The Gross Motor Function Classification System (GMFCS) is an excellent way to classify the motor deficits in CP. The Gross Motor Function Classification System (GMFCS) developed by CanChild, Canada a classification system that describes the gross motor functions in cerebral palsy on the basis of self-initiated movement abilities. The gross motor function be categorised into 5 different levels

GMFCS Classification Levels

- GMFCS Level I – walks without limitations.
- GMFCS Level II – walks with limitations
- GMFCS Level III – walks with adaptive equipment assistance.
- GMFCS Level IV – self-mobility with use of powered mobility assistance. Usually supported when sitting; self-mobility is limited
- GMFCS Level V – severe head and trunk control limitations.

2. **Modified Kuppusamy scoring (2012) for assessing the Socio-economic status.**

Kuppusamy scale is a time tested scale for assessing the socio-economic status (SES) of Indians. Depending on the educational achievements, occupation and monthly income the scale classifies the socio-economic status into five SES groups. to upper, middle and lower SES groups.

Table 3: Modified Kuppusamy scoring scale (2012)

(A) Education Score				
1	Professional or Honors			4
2	Graduate or Post Graduate			3
3	High school or Intermediate or Diploma			2
4	Illiterate or Primary school			1
(B)	Occupation Score			
1	Legislators, Senior Officials, and Managers			13
2	Professionals			11
3	Technicians and Associate Professionals			9
4	Clerks			7
5	Service Workers and Shop and Market Sales Workers			6
6	Skilled Agricultural and Fishery Workers			5
7	Craft and Related Trades Workers			4
8	Plant and Machine Operators and Assemblers			3
9	Unskilled worker			2
10	Unemployed			1
(C) Monthly family income in ₹		Score	Modified for 1998[3] in ₹	Modified for 2012 in ₹
1	≥2,000	12	≥13,500	≥32,050
2	1,000-1,999	10	6,750-13,499	16,020-32,049
3	750-999	6	5,050-6,749	12,020-16,019
4	500-749	4	3,375-5,049	8,010-12,019
5	300-499	3	2,025-3,374	4,810-8,009
6	101-299	2	676-2,024	1,601-4,809
7	≤100	1	≤675	≤1,600
Total Score			Socioeconomic class	
26-29			Upper (I)	
16-25			Upper Middle (II)	
11-15			Middle/Lower middle (III)	
5-10			Lower/Upper lower (IV)	
<5			Lower (V)	

3. Vineland Adaptive Behaviour Scales (VABS)[94]

The VABS is designed to measure adaptive behaviour of individuals from birth to adulthood. The VABS is designed to be administered individually. Eleven general subdomains are grouped into four domains: communication, daily living skills, socialization, and motor skills. The domains are made up of subdomains in which the scores are added to form the domain composite scores. The four domain composite scores then combine to form the Adaptive Behaviour Composite (ABC) for those individuals aged birth to 6 years 11 months. Three domain composite scores (communication, daily living skills and socialization) combine to form the Adaptive Behaviour Composite for those aged 7 through adulthood

The VABS is a standardized norm-referenced assessment tool that can be used for:

- measuring an individual's daily functioning
- measuring deficits in adaptive behaviour
- clinical diagnosis of, developmental delays, emotional and behavioural disturbances
- developmental evaluations
- monitoring the developmental progress

Since many children with CP have difficulties in communication, mobility and in their daily living skills, we used the scores on the Social domain as a surrogate marker for their cognitive abilities.

4. WHO Anthro Plus Software[68]

WHO Anthro Plus is a computer program created by the World Health Organization (WHO) that compares height/weight/length data for children age 0-19 years to the WHO child growth standards

5. MRI classification system (MRICS) for children with cerebral palsy[72]

The MRICS is a classification system developed by the Surveillance of Cerebral Palsy in Europe to report the MRI in children with CP and is based on pathogenic patterns occurring in different period of brain development. The MRI classification system (MRICS) consists of five main groups: mal-developments, predominant white matter injury, predominant grey matter injury, miscellaneous, and normal findings. As mentioned by the authors in the paper, whenever there were several patterns, the predominant pattern that is believed most likely to have led to the CP was classified first. **(Table 1,** page 22)

RESULTS

This study was done to estimate the prevalence and identify the risk factors which result in epilepsy in a cohort of children with cerebral palsy.

There were a total of 439 children who fulfilled the inclusion criteria and were included in the study. Of these 303 (69%) were boys and 136 (30.9%) were girls. The children were divided in to two groups depending on the presence of epilepsy.

Prevalence of Epilepsy: There were 169 children who had epilepsy and thus the prevalence of epilepsy in this cohort was of **38.5%** (33.9 to 43.2 95% CI) (Table 4).

Part I: COMPARISON OF CHILDREN WITH EPILEPSY AND THOSE WITHOUT EPILEPSY

Part I of the results compares the children with epilepsy and those without epilepsy. The median age of the children who were in the study group was 45 months. There was not much difference in the median age of those with epilepsy compared to those without epilepsy ($p = 0.78$). There was also no difference in the proportion of consanguinity between the two groups ($p = 0.56$). Socio economic status, estimated using the Modified Kuppusamy score were similar between the two groups ($p = 0.16$) (Table 4)

A. DEMOGRAPHIC CHARACTERISTICS (Table 4)

Table 1 shows the demographic characteristics of the cohort.

Table 4: Clinical characteristics and Demographic details of the cohort

Demographic and clinical characteristics	Children without Epilepsy (%)	Children with Epilepsy (%)	P VALUE
Total number of children	270 (61.5)	169 (38.5)	
Girls	182 (67.4)	121(71.6)	
Boys	88 (32.5)	48 (28.4)	
Median age of the children	46 months	44 months	
Range (in months)	12 to 195	12 to 177	0.78
IQR	27 to 68	26 to 75	
Parental consanguinity	37 (13.7)	19 (11.24)	0.56
Socio-economic status			
Lower class	71 (26.3)	59 (34.9)	
Middle class	91 (33.7)	50 (29.59)	0.16
Upper class	108 (40.0)	60 (35.5)	
Microcephaly	189 (70)	155 (91.7)	<0.001
Malnutrition	185 (68.5)	113 (66.9)	0.75
Stunting	204 (75.6)	125 (73.4)	0.74
Social quotient (<70)	183 (67.8)	160(94.7)	<0.001
History of Neonatal seizures	50(18.5)	80(42.3)	<0.001
Family History of seizures	2 (0.7)	69(40.6)	<0.001

B. ANTHROPOMETRIC CHARACTERISTICS (Table 4)

Z score of weight for age, Z score of height for age and Z score of the head circumference for age was estimated using the WHO-ANTHRO software. Majority of the children in both groups were malnourished (Z score of weight for age <-2SD), stunted (Z score of height for age <-2SD) and had microcephaly (Z score of HC for age <-2SD). There was no difference in the proportion of children who were malnourished (p=0.75) or stunted (0.74). However there was a significantly higher proportion of children with microcephaly in the group with epilepsy (p<0.001).

C. CLINICAL CHARACTERISTICS

1. Cognition (Table 4)

The Social Quotient of the Vineland Adaptive Behaviour Scales (VABS) was used as a surrogate marker of the child's cognitive capacity. Children who had SQ of >70 were categorized as having normal cognition and those with SQ <70 were categorized as having cognitive impairments. In the study majority of the children (78.1%) had SQ of less than 70. But significantly almost 94% of children with epilepsy had a low SQ compared to 68% among those without epilepsy (p<0.001).

2. History of Neonatal seizures (Table 4)

Almost one-third of children in the cohort had history of neonatal seizures. However there was a significantly higher prevalence of neonatal seizures among those who subsequently developed epilepsy (p < 0.001)

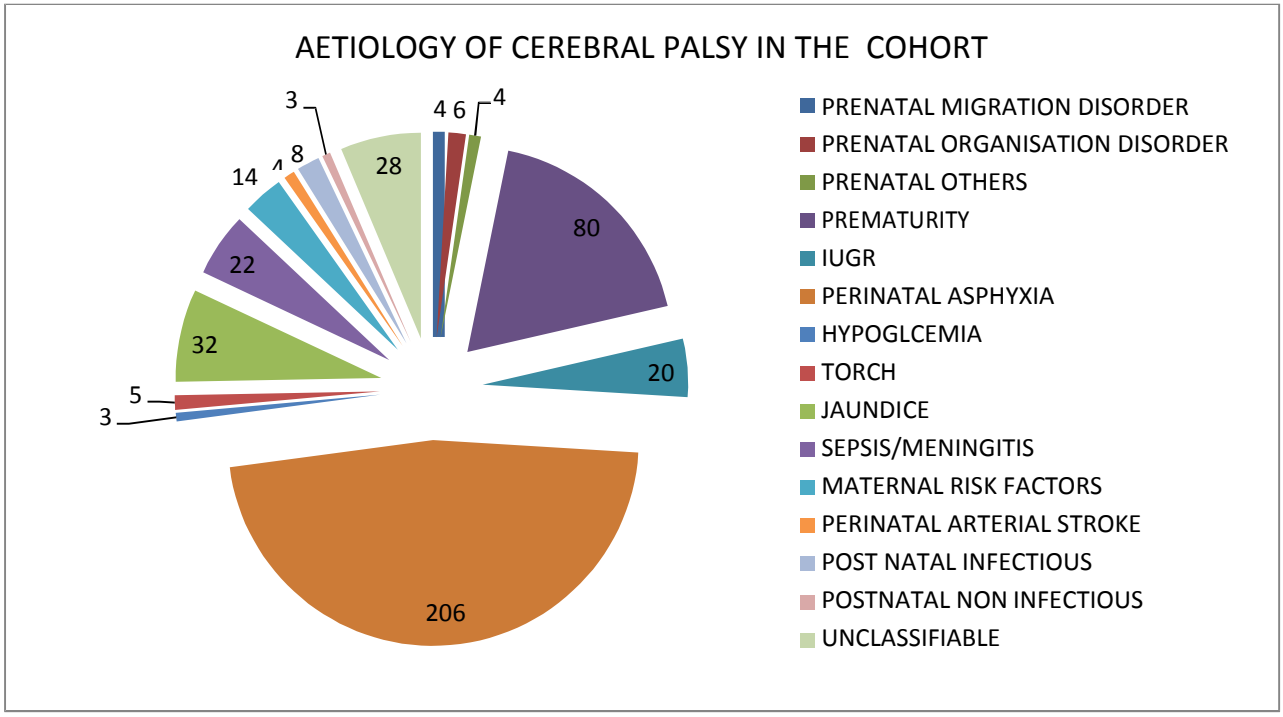
3. **Family History of seizures (Table 4)**

Family history of epilepsy was significantly much more in children with epilepsy as compared to those without epilepsy (p <0.001).

D. AETIOLOGY OF CEREBRAL PALSY

Cerebral palsy is a static encephalopathy resulting non-progressive brain damage in the prenatal, perinatal and postnatal periods. The Figure 2 and table 5 below show the aetiologies of CP in this study.

Figure 2: Aetiology of Cerebral Palsy in the cohort.



Unfortunately like other Indian studies, perinatal causes – mainly perinatal asphyxia (46.5%) was the main cause of CP in this country. Other significant causes included prematurity and intrauterine growth retardation, sequelae of neonatal hyperbilirubinemia (kernicterus), perinatal sepsis and meningitis. Perinatal causes

comprised nearly 88% of the entire cohort. There was significant proportion of children who could not be classified. These children did not have any history of antenatal complications, no delivery related complications, normal birth weight, no complications in the neonatal period or any postnatal complications, but were detected to have CP in the first year.

Table 5: Aetiology of children in the cohort (those without epilepsy compare to those with epilepsy)

Aetiology	No Epilepsy	Epilepsy	Total
Disorders of Prenatal Onset	9 (3.3)	5 (2.9)	14 (3.1)
Migration disorders	1 (0.3)	3 (1.7)	4 (0.9)
Disorders of organization	4 (1.4)	2 (1)	6 (1.3)
Other disorders of brain malformation	4 (1.4)	0	4 (0.9)
Disorders of Perinatal and Neonatal Onset			
Prematurity	57 (21)	23 (31.6)	80 (18)
IUGR	14 (5)	6 (3.5)	20 (4.5)
Perinatal asphyxia	107 (40)	99 (58.5)	206 (46.9)
Hypoglycemia	1 (0.3)	2 (1)	3 (0.6)
TORCH infection sequelae	3 (1)	2 (1)	5 (1)
Neonatal Hyperbilirubinemia sequelae	30 (11)	2 (1)	32 (7.3)
Perinatal sepsis or meningitis	11 (4)	11 (6)	22 (5)
Multiple maternal risk factors	11 (4)	3 (1.7)	14 (3.1)
Perinatal arterial stroke	4 (1.4)	0	4 (0.9)
Disorders of Post-natal onset (after Neonatal period)			
Postnatal infection - meningitis, encephalitis	3 (1)	5 (3)	8 (1.8)
Post natal Non- infectious cause	1 (0.3)	2 (1)	3 (0.6)
Unclassifiable or aetiology unknown	19 (7)	9 (5.3)	28 (6.3)
Total	270 (100)	169 (100)	439 (100)

E. EPILEPSY AND ITS RELATION TO THE TOPOGRAPHY

Depending on the limbs involved and the type of tonal involvement cerebral palsy was classified into different topographies – Spastic (diplegia, hemiplegia, quadriplegia), Dyskinetic (dystonic and choreo-athetoid), Mixed (presence of a combination of spasticity and dyskinetic movements) and Hypotonic forms which included Ataxic CP as well.

The Spastic forms of cerebral palsy (Spastic hemiplegia, diplegia and quadriplegia) comprised three quarters of the cohort (330 children). Among the spastic form, quadriplegic CP was the most common and comprised nearly half of the children with spastic CP. This was followed by Mixed cerebral palsy (combination of both spastic and dyskinetic CP) which comprised 17% (75 children), and dyskinetic CP (which included both dystonic and choreo-athetoid types) comprised 6.6% (29 children) while ataxic and hypotonic forms comprised the remaining 1% (5 children) (Table 6).

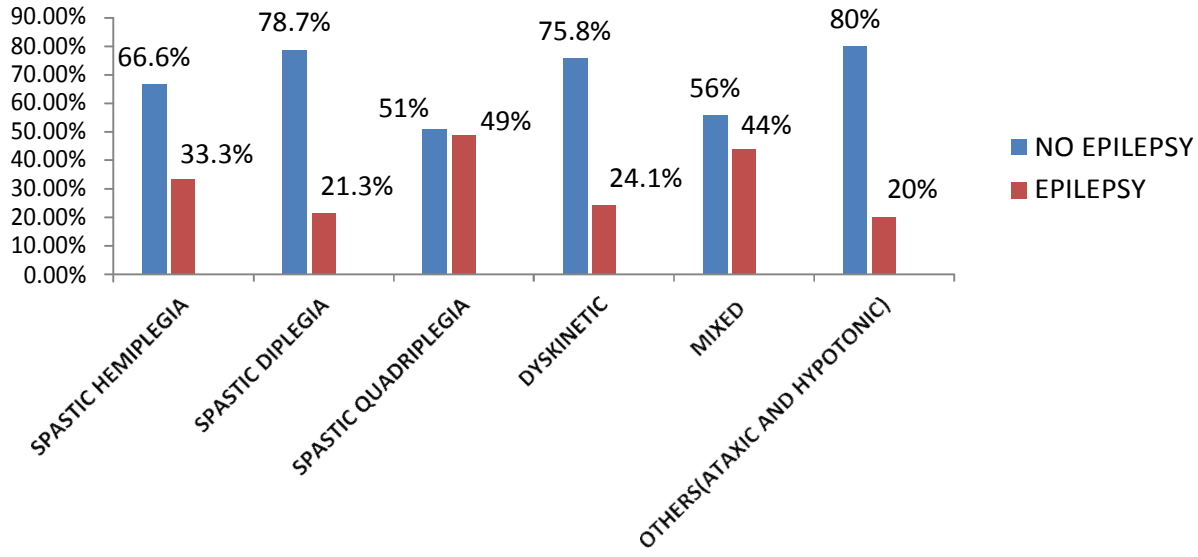
Table 6: Topographic distribution of children with epilepsy and those without epilepsy.

Topography	Without Epilepsy	With Epilepsy	TOTAL
Spastic hemiplegic	32 (11.9)	16 (9.5)	**48 (10.9)**
Spastic diplegic	74 (27.4)	20 (11.8)	**94 (21.4)**
Spastic quadriplegic	96 (35.6)	92 (54.4)	**188 (42.8)**
Dyskinetic:			
Dystonic	13 (4.8)	5 (3.0)	**18 (4)**
Choreo-athetoid	9 (3.3)	2 (1.2)	**11 (2.5)**
Mixed type	42 (15.6)	33 (19.5)	**75 (17.1)**
Ataxic and Hypotonic	4 (1.5)	1 (0.6)	**5 (1.1)**
TOTAL	**270 (100)**	**169 (100)**	**439 (100)**

Table 6 also compares the prevalence of epilepsy between the two groups (those with epilepsy and those without epilepsy) among the various types of CP. The prevalence of epilepsy did not differ much between the two groups except in those with spastic diplegia and in those with quadriplegia. There was a larger proportion of children with diplegia in those without epilepsy (27.4% vs. 11.8%) while there was a much higher proportion of children with quadriplegia in the group with epilepsy (54.4% vs. 35.6%).

Figure 3 shows the compares the proportion of children with and without epilepsy among the different topographies. About one third of children with spastic hemiplegia had seizures. While only about a quarter of children with diplegia and dyskinetic CP had seizures. However nearly half of children with quadriplegia and a little less than half of children with mixed CP had seizures.

Figure 3: Distribution of epilepsy among the topography



F. EPILEPSY AND ITS RELATION TO THE GMFCS SCORE

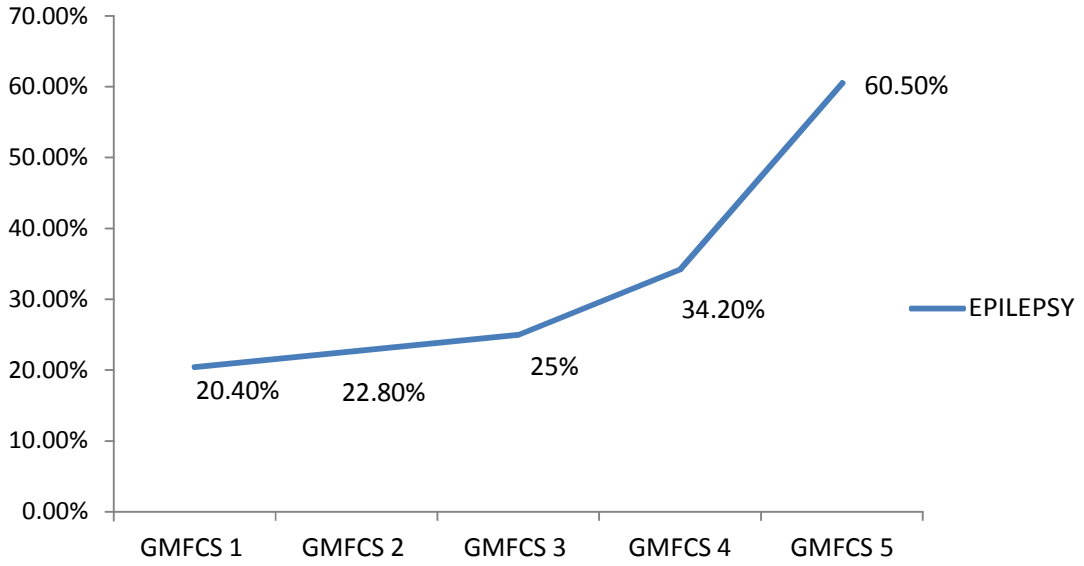
The gross motor abilities of every child in the cohort were assessed using the Gross Motor Functional Classification Scoring (GMFCS). Table 7 depicts the distribution of the cohort according the GMFCS ratings. Among the children with no epilepsy, largest group was those who were GMFCS Level III, while among those with epilepsy GMFCS level V comprised the largest group.

Table 7: Distribution of the children according to the GMFCS score

GMFCS	NO EPILEPSY	EPILEPSY	TOTAL
Level I	39 (14.5)	10(5.9)	**49(11.1)**
Level II	44(16.3)	13(7.7)	**57(12.9)**
Level III	75(27.8)	25(14.8)	**100(22.8)**
Level IV	50(18.5)	26(15.4)	**76(17.3)**
Level V	62 (22.9)	95 (56.2)	**157(35.8)**
TOTAL	**270 (100)**	**169 (100)**	**439 (100)**

Figure 4 shows the proportion of children with epilepsy among the various GMFCS levels. The prevalence of epilepsy progressively increased as the gross motor abilities worsened. GMFCS level V group had a highest prevalence of children with epilepsy 60.5% (95 children), and followed by GMFCS IV -35.5% (27 children) then and GMFCS III with 25% (25 children). Epilepsy was significantly less in those who were ambulatory (GMFCS levels I and II). Prevalence of epilepsy was 20% in those with GMFCS level I and 22.8% in those with GMFCS level II (p value for trend <0.01).

Figure 4: Prevalence of epilepsy increases with worsening GMFCS score.



G. NEUROIMAGING IN CHILDREN WITH CP

In this cohort 302 (68.7%) of the children had MRI scans and the findings were classified according to the MRICS and the results are presented in the table 8 below. The predominant lesions in this cohort of children with cerebral palsy (irrespective whether they had epilepsy or not) were periventricular lesions, basal ganglia/ thalamic lesions and cortical/subcortical lesions. Only 6% (18/302) children had normal MRI scans. Children with basal ganglia lesions were less likely to have seizures, which children with cortical lesions were more likely to have seizures. There was not much difference between in those with periventricular lesions.

The children with grouped under “Miscellaneous” did not have a single pattern and on most occasions had different patterns which were difficult to classify under the under sections.

Table 8: MRICS classification of the children who underwent MRI in this cohort

	No Epilepsy (%)	Epilepsy (%)	Total (%)
A. **Mal-developments**			
A1. Disorders of Cortical Formation	8 (4.2)	4 (3.6)	12 (4)
A2. Other mal-developments (HPE, DW, ACC, CH)	2 (1)	0	2 (0.7)
B. Predominant White Matter Injury			
B1. PVL (mild/ severe)	76 (39.7)	33 (29.7)	109 (36)
B2. Sequelae of IVH or Periventricular Haemorrhagic	1 (0.5)	1 (0.9)	2 (0.7)
Infarction	1 (0.5)	3 (2.7)	4 (1.4)
B3. PVL and IVH combination			
C. Predominant Grey Matter Injury			
C1. Basal Ganglia/ Thalamic lesions (mild/severe)	55 (28.8)	17 (15.3)	72 (23.8)
C2. Cortical-subcortical lesions only	21 (11)	32 (29)	53 (17.5)
(watershed/multicystic encephalomalacia)			
C.3. Arterial infarctions (middle cerebral artery/other)	4 (2)	3 (2.7)	7 (2.3)
D. **Miscellaneous**[#]	9 (4.7)	14 (12.6)	23 (7.6)
E. **Normal**	14 (7.3)	4 (3.6)	18 (6)
	191 (63.2)	**111 (36.8)**	**302 (100)**

HPE - holoprosencephaly, DW - Dandy–Walker malformation, ACC - Agenesis of corpus callosum, CH – Cerebellar Hypoplasia, IVH – Intraventricular haemorrhage, PVL – Periventricular leukomalacia

[#]Miscellaneous (examples: cerebellar atrophy, cerebral atrophy, delayed myelination, ventriculomegaly not covered under Haemorrhage not covered under B, brainstem lesions, calcifications)

H. CO-MORBIDITIES IN CHILDREN WITH AND WITHOUT EPILEPSY

Children with CP have multiple comorbidities. Nearly 40% of the children in this cohort had comorbidities. The table 9 below compares the rate of comorbidities with the children who had epilepsy and those without epilepsy. The children who had epilepsy had a proportionately higher prevalence of all comorbidities. However, the

proportion of the following comorbidities were significantly higher ($p<0.01$) in children with epilepsy – presence of visual impairment (which included visual impairment and cortical visual impairment), and oro-motor complications (drooling and swallowing difficulties). As mentioned earlier in Table 4, microcephaly and malnutrition were significantly higher in children with epilepsy.

Table 9: Co-morbidities in children with and without epilepsy

CO-MORBIDITIES	No Epilepsy (%) (n=270)	Epilepsy present (n=169)	TOTAL	P VALUE
Dysmorphism	8 (3)	6 (3.6)	**14 (3.2)**	0.78
Visual impairment	91 (33.7)	97 (57.4)	**166 (42.8)**	<0.001
Drooling	82 (30)	92 (54.4)	**174 (39.6)**	0.001
Swallowing	41 (15.2)	42(24.8)	**83 (18.9)**	0.017
Dental caries	27 (10)	19 (11.2)	**46 (10.5)**	1.0
Hip dislocation	6 (2.2)	8 (4.7)	**14 (3.2)**	0.17
Contractures	31 (11.5)	22 (13)	**53 (12.1)**	0.231
Hearing loss	17 (6.3)	6 (3.6)	**23 (5.2)**	0.27
Autism	15 (5.6)	18 (10.6)	**33 (7.5)**	0.06
GERD*	9 (3.3)	5 (3)	**14 (3.2)**	0.86

*GERD: Gastroesophageal reflux

I. PROBABLE RISK FACTORS WHICH COULD HAVE PREDISPOSED TO EPILEPSY IN CP

This being a cross sectional study we could only speculate on the possible risk factors which result in epilepsy. Table 10 shows the potential risk factors and their association with epilepsy. Family history of epilepsy, history of neonatal seizures, history of asphyxia were significantly associated with the occurrence of epilepsy in CP. There was a higher proportion of children with birth weight < 2500 g in the children without epilepsy (although this was not statistically significant).

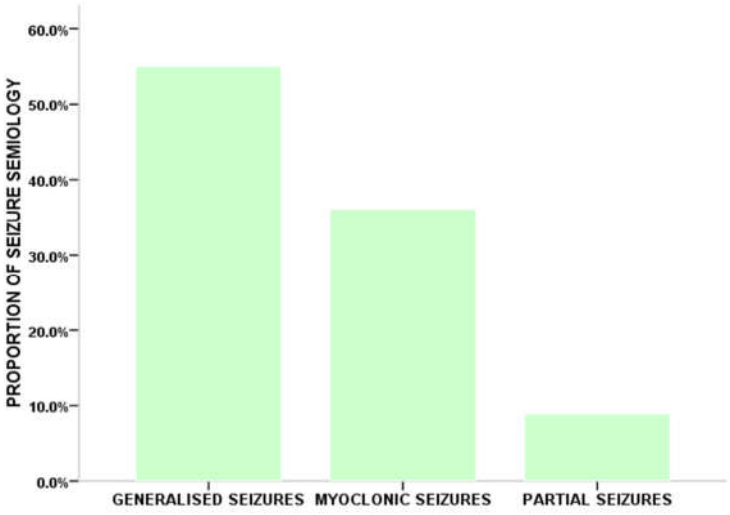
Table 10: Risk factors which predispose to Epilepsy in children with CP

	CP only (N = 270)	CP-Epilepsy (N = 169)	Prevalence Odds ratio (95% CI)	P value
Girls	87 (51.8)	49 (28.7)	0.84 (0.55-1.27)	0.459
Birth-weight (<2500 g)	148 (55)	84 (49.4)	0.78 (0.53-1.15)	0.24
Low SES	160 (59.5)	111 (65.3)	1.25 (0.84-1.86)	0.314
Family History of epilepsy	2 (0.75)	69 (40.5)	89.8 (21.6-373.8)	**<0.001**
Aetiology				
Asphyxia	106 (39.5)	100 (58.4)	2.15 (1.46-3.18)	**<0.001**
Prematurity	71 (26.3)	29 (17.2)	0.59 (0.34-0.99)	**0.056**
Neonatal seizures	50 (18.7)	80 (46.8)	3.83 (2.95-5.89)	**<0.001**

PART 2: DESCRIPTION OF EPILEPSY IN CHILDREN WITH CEREBRAL PALSY

As mentioned already, 169 (38.5%) of the children in the study had epilepsy. The second part of the Results section deals with the description of the epilepsy. Generalized seizures (generalized tonic-clonic seizures) were the most predominant kind (55%) followed by myoclonic seizures (36%) and the least common were the partial (simple and complex) seizures (9%) (figure 5).

Figure 5: Semiology of seizures in the cohort

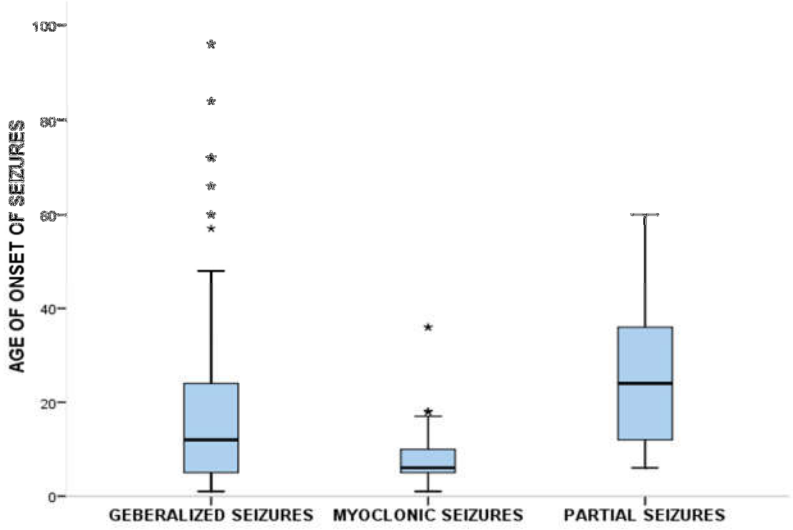


A. AGE OF ONSET OF ONSET OF SEIZURES

The mean age of onset of seizures for our cohort was 15.6 months (SD 18) (median age of onset of seizures was 9 months). Majority (67.4%, 114 children) of the children had their first seizure before one year of age, 17.2% (29 children) had onset of seizures between 12 and 24 months, 5.3 % (nine children) had onset between two and three years, 3.6% (6 children) had onset of seizures between three and four years, and remaining 6.5% (11 children) had onset of seizures after four year of age.

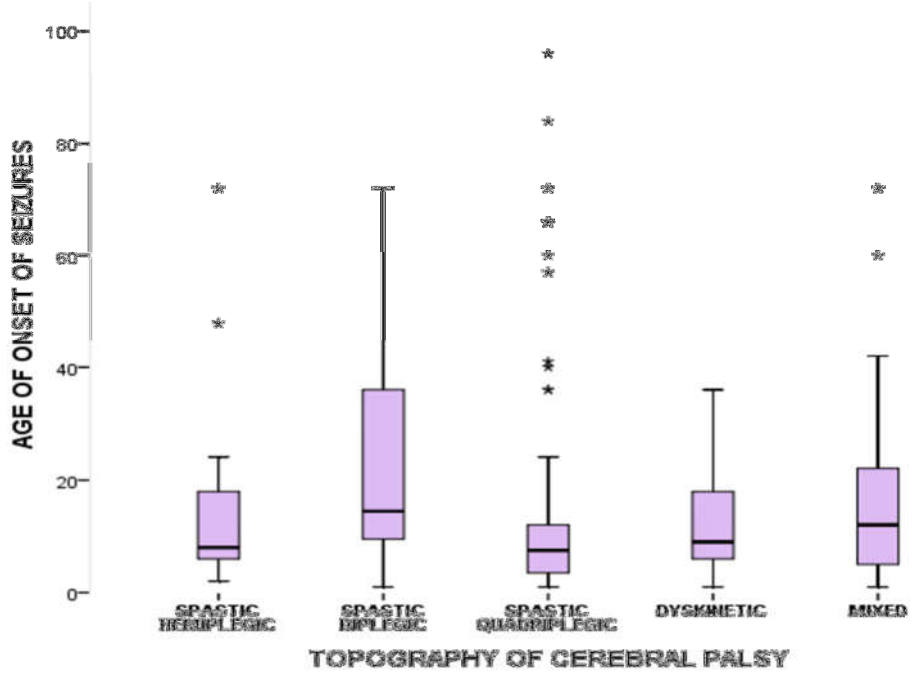
Generalized epilepsies (excluding myoclonic seizures) which accounted for about 55%, had a median age of onset of 12 months. Myoclonic seizures (which comprised 36.1%) started much earlier at a median age of onset of 6 months, and partial epilepsies (which comprised about 9%) had a median age of onset of 24 months (figure 6)

Figure 6: Age of onset of seizures according to the semiology



The age of onset was also different in the various topographies as depicted in figure 6. Children with Spastic quadriplegic CP had the earliest onset and seizures started at a median age of 7.5 months [Mean (SD): 13.6 (18.2)]. The median ages of onset of the other forms were as follows – 8 months for hemiplegic CP [Mean (SD): 16 (18.6)], 9 months for dyskinetic CP [Mean (SD): 13.4 (12)], 12 months for mixed CP [Mean (SD): 16.3 (16.5)].and 14.5 months of diplegic forms of CP [Mean (SD): 23.5 (20)].

Figure 7: Age of onset of seizures according to the topography



Among the 169 children with epilepsy only nine had social quotient above 70. In those with SQ of >70 the average age of onset of seizures was 23.1 (SD 28) and median of 6 months and those with epilepsy the average age of onset of seizure was 15.1 (SD 17) and median of 9 months. This results were not significant (p = 0.2).

B. SEMIOLOGY OF EPILEPSY

Table 11 shows the relationship between the topography of epilepsy and the semiology. Children with Quadriplegic form of cerebral palsy comprised more than half of the children with epilepsy. More than half of the children with quadriplegic CP with epilepsy had generalized seizures. Myoclonic seizures were also common in quadriplegic CP. Generalized seizures were also the common semiology in all other types of CP except in Dyskinetic CP where myoclonic epilepsy was the most common kind.

Table 11: Semiology of seizures according to the topography

Topography	Generalized Seizures	Myoclonic Seizures	Partial Seizures	Total
Spastic Hemiplegia	10	3	3	16
Spastic Diplegia	15	4	1	20
Spastic Quadriplegia	47	38	7	92
Dyskinetic	2	4	1	7
Ataxia and Hypotonic	1	0	0	1
Mixed	18	12	3	33
TOTAL	**93**	**61**	**15**	**169**

C. EEG FINDINGS

EEG was done in 156 out of 169 children with epilepsy. Unfortunately, in 13 children EEG could not be done. There were 49 children (31.5%) who had normal sleep EEG, 72 children (46.2%) had generalized epileptiform discharges, and 27 children (17.3%) had focal epileptiform discharges. Eight children (5.1%) had hypsarrhythmia pattern.

Figure 8: EEG findings in the study group

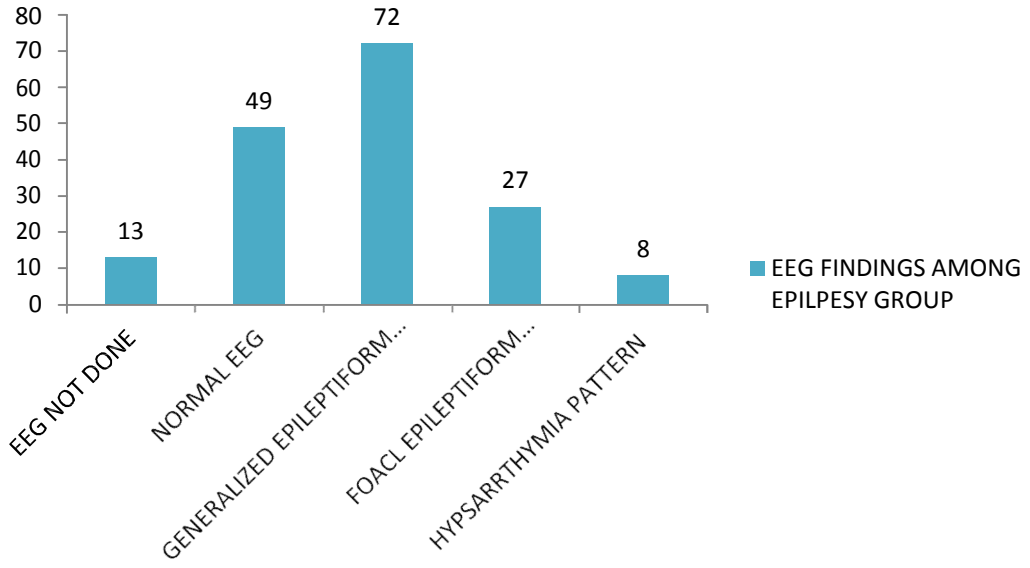


Table 12 shows the distribution of the EEG findings according to the Topography. Generalized discharges predominated in all the different topographies. Focal seizures were present mainly in the quadriplegic and mixed forms of seizures. Significantly a significant proportion of the children with epilepsy had normal EEGs – (19% in hemiplegics, 45% of diplegics, 24% of quadriplegics, 28% of dyskinetic CP and 33% of mixed CP).

Table12: EEG finding according to the Topography of CP

	Normal EEG	Generalised Discharges	Focal Discharges	Hypsarrhythmia	Total
Spastic Hemiplegia	3	10	1	1	16
Spastic Diplegia	9	4	1	1	20
Spastic Quadriplegia	22	42	17	5	92
Dyskinetic	2	3	1	0	7
Ataxic / Hypotonic	0	1	0	0	1
Mixed	11	12	7	1	33
	47	**71**	**27**	**8**	**169**

(EEG was not done in 13 children: Hemiplegic CP -1; Diplegics -5; Quadriplegics -6; Dyskinetic – 1; Mixed -2)

D. Anticonvulsant therapy and response to treatment.

Seizures were controlled with mono therapy in about a third (62 children - 37%), of the children. More than two-thirds (103 children - 61%) of the children required poly-therapy. There were also 4 children who had been on medication in the past, and since they remained seizure free for more than 2 years, anticonvulsants were withdrawn.

Figure 9: Anticonvulsants usage in the cohort

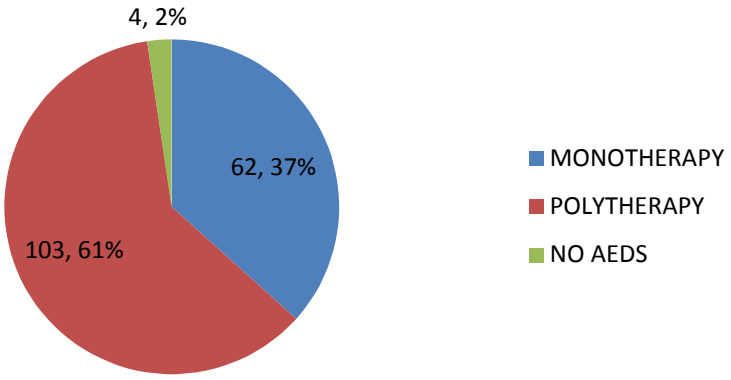


Figure 10 shows the anti-convulsant requirement according to the topography.

Majority of the children with quadriplegic CP required polytherapy.

Figure 10: Antiepileptic therapy usage according to the topography

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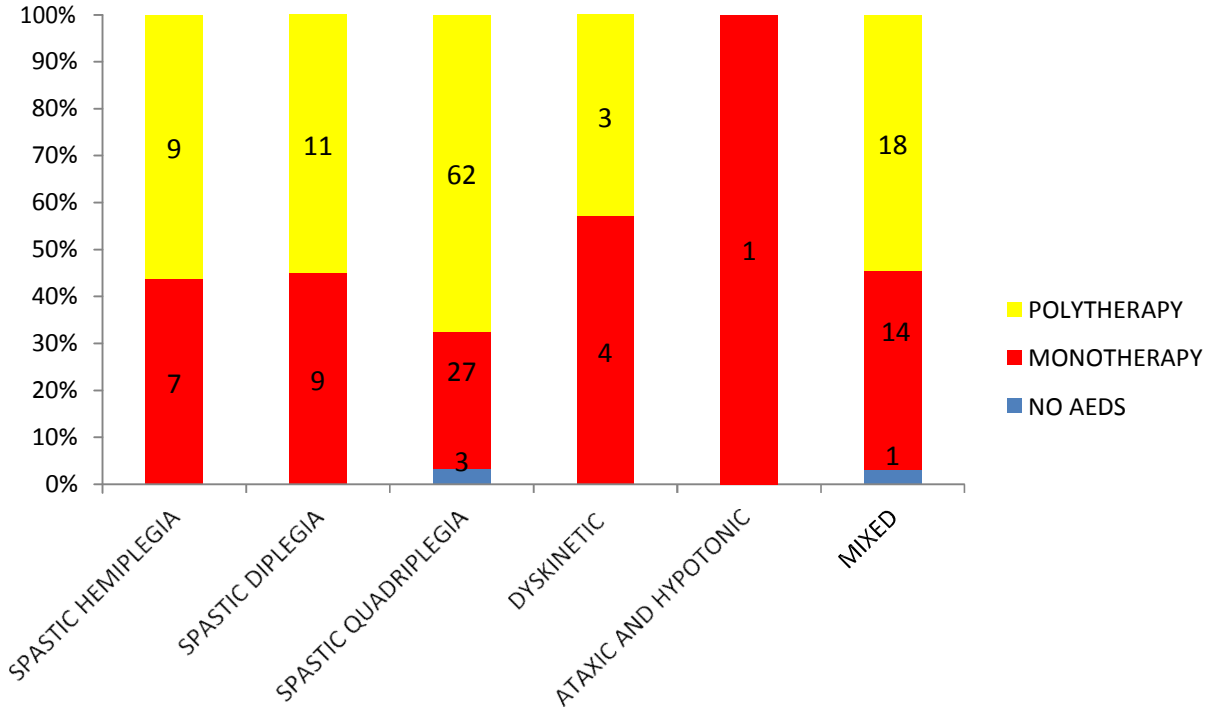


E. Factors contributing to uncontrolled seizures

Among the 169 children seizures were uncontrolled in 45 children (26.6%) and were controlled in the remaining 124 (73.3%) children. The table 13 below shows the factors which were associated with uncontrolled seizures. Generalised seizures, abnormal EEG, non-ambulant status and polytherapy were significantly associated with uncontrolled seizures.

Table13: Factors associated with uncontrolled seizures

	Seizures controlled (n=124)	**Uncontrolled seizures (n=45)**	**P value**
Non-ambulant CP (GMFCS levels III-V)	102 (82)	44 (98)	0.009
Mean age of onset	16.7 months	12.8 months	0.281
Children on Poly therapy (%)	66 (53)	38 (84)	<0.001
History of neonatal seizures	59 (48)	21 (47)	1.0
Family history or seizures	52 (42)	17 (38)	0.45
Social quotient <70	115 (93)	45 (100)	0.11
Seizure semiology			
Generalized	72 (58)	21(47)	
Myoclonic	39 (31)	22 (49)	0.09
Partial	13 (10)	2 (4)	
Abnormal EEG	68 (62)	38 (86)	0.004
Topography			
Spastic Hemiplegia	16 (100)	0	
Spastic Diplegia	18 (90)	2 (10)	
Spastic quadriplegia	59 (64)	33 (36)	
Mixed	25 (74)	8 (26)	
Dyskinetic CP	5 (71)	2 (29)	

PART 3: DESCRIPTIONS OF OTHER CHARACTERISTICS OF THE STUDY GROUP

A. Relationship between Topography and GMFCS classification

Table 14 shows the relationship between GMFCS and Topography. Majority of the 106 children (73%, 77 children) who were GMFCS levels I and II (ambulant independently) had spastic hemiplegia or spastic diplegia. Children who had spastic quadriplegic CP, dyskinetic CP and mixed forms of CP could not walk independently and were GMFCS level III- V. In this cohort there were few children with hypotonic/ ataxic CP and majority of them were not ambulant and were GMFCS V. There were 6 children who were classified as spastic quadriplegic CP yet were ambulant independently so were GMFCS level 1. This seemingly paradoxical situation was because in these children tone was mildly increased in the lower limbs which did not limit their walking. However, the tone in their upper limbs was increased limiting use of either one (spastic triplegia) or both of their upper limbs. These children other significant co-morbidities like microcephaly, pseudo-bulbar palsy limiting their oro-motor functions, epilepsy and significant cognitive impairments

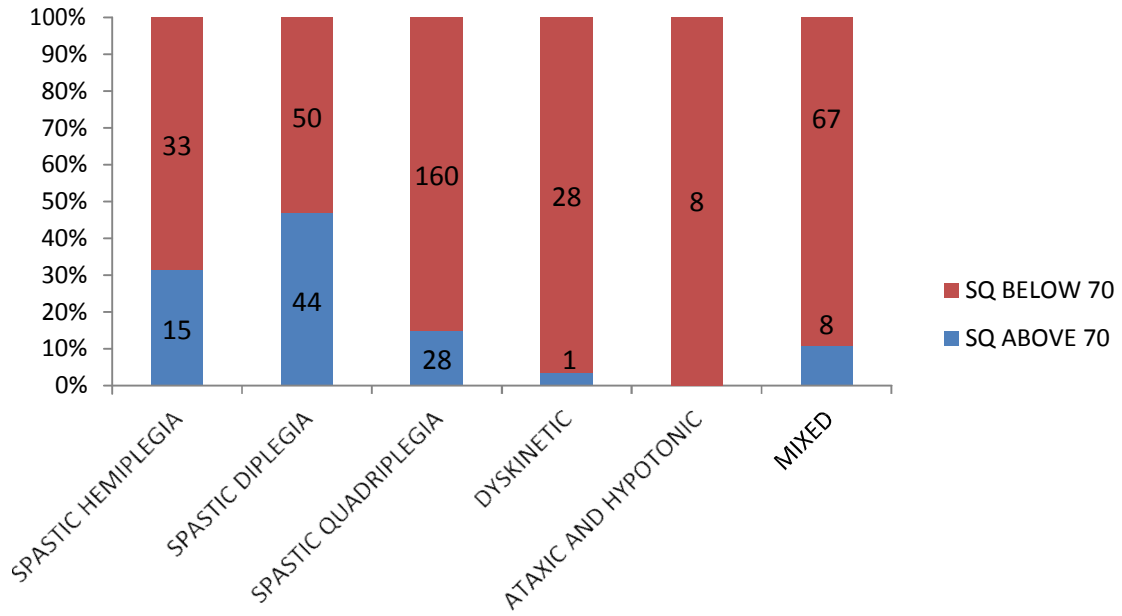
Table 14: Relationship between GMFCS and CP Topography

Topography	GMFCS I	GMFCS II	GMFCS III	GMFCS IV	GMFCS V	TOTAL
Spastic Hemiplegia	27	11	8	1	1	**48(10.9)**
Spastic Diplegia	13	26	39	10	6	**94(21.4)**
Spastic Quadriplegia	6	11	36	46	89	**188(42.8)**
Dyskinetic CP	3	5	6	5	10	**29(6.6)**
Ataxic & Hypotonic CP	0	1	0	1	3	**5(0.1)**
Mixed CP	0	3	11	13	48	**75(17)**
Total	**49 (11.1)**	**57 (13)**	**100 (22.8)**	**76 (17.3)**	**157 (35.7)**	**439**

B. Social Quotient (SQ) on the VABS and its relationship to the CP Topography and to the GMFCS.

Figure 11 shows the relationship between topography and the social quotient (SQ) on the VABS which was used as a surrogate for intelligence. Social quotient varied according to the topography. Nearly half of children with spastic diplegia and about a third of the children with spastic hemiplegia, had SQ above 70. In the other types of CP more than 85% had SQ of less than 70. Majority (85.1%) of children with spastic quadriplegia, 89% of children with mixed CP and 97% of children with dyskinetic CP had SQ less than 70. All the children with ataxic and hypotonic forms of CP were cognitively compromised. Poor social quotient on the VABS was strongly associated with worsening ambulation as well. In both GMFCS I and II about 43% of children had SQ more than 70; in GMFCS III 36% had SQ more than 70; in GMFCS IV 13.2 had SQ above 70, whereas in GMFCS V there were only 2.5% of the children had SQ above 70. This trend was very significant ($p<0.01$).

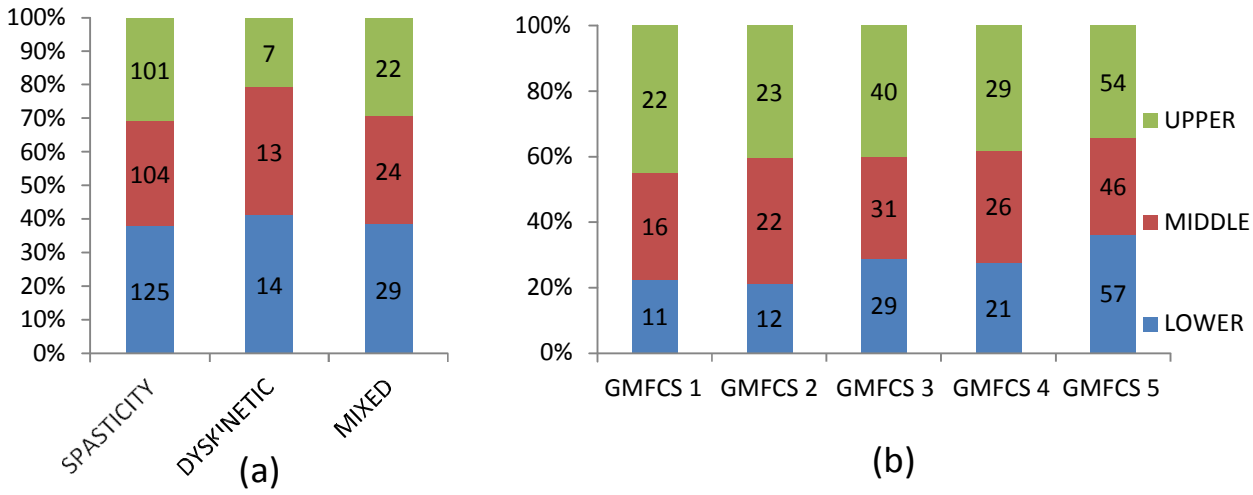
Figure 11: Social Quotient according to the topography



C. CP Topography and GMFCS levels and their relation to the Socio-economic scale

Figure 12 shows the distribution of the SES among the various types of CP (a) and the different levels of GMFCS. As is evident in the graph, there was almost equal proportion of children for the various socio- economic strata in the spastic and mixed forms of CP. There seems to be a lesser proportion from the lower SES in the dyskinetic group. The distribution also seems to be uniformly distributed among the various GMFCS levels.

Fig 12: Distribution of the SES levels among CP topography (a) and the GMFCS (b)



D. CP Topography and it relation to Neonatal Seizures

History of neonatal seizures was significantly higher in the group of children with epilepsy. Seizures in the neonatal period seems to be related to the severity of CP. In children with Spastic quadriplegic cerebral palsy group 35.6% (67 children), 34.6% (26 children) of children in the mixed group had history of neonatal seizures. In children with spastic diplegia the occurrence was lesser in frequency 25%, in Spastic

hemiplegia it was 18% (12 children), and in the group with dyskinetic CP it was 27% (8 children). There was no history of neonatal seizures in the children with ataxic and hypotonic cerebral palsy.

E. Topography and Aetiology

Table 15 shows the distribution of the various aetiologies in the different topographies of CP. There was no particular predominance to any topographic pattern in the disorder of prenatal onset. However, in disorders of perinatal onset – children who had perinatal asphyxia were most likely to be quadriplegic or have mixed CP. Those who were premature and those who had IUGR were likely to have quadriplegic or diplegic CP. As expected children with neonatal hyperbilirubinemia had dyskinetic or mixed forms of cerebral palsy. Perinatal strokes presented with hemiplegic form of CP.

Table 15: Relationship between etiology of cerebral palsy and topography

AETIOLOGY	HEMI - PLEGIC CP	DIPLEGIC CP	QUADRI – PLEGIC CP	DYSKINETIC CP	ATAXIC & HYPOTONIC CP	MIXED CP	TOTAL
Disorders of Prenatal Onset							
Migration disorders	0	0	2	0	1	1	4
Disorders of organization	0	1	2	2	1	0	6
Other disorders of brain malformation	0	1	2	1	0	0	4
Disorders of Perinatal and Neonatal Onset							
Prematurity	3	31	38	1	0	7	80
IUGR	2	7	11	0	0	0	20
Perinatal asphyxia	20	27	96	9	2	52	206
Hypoglycaemia	0	2	1	0	0	0	3
TORCH infection sequelae	1	0	4	0	0	0	5
Neonatal Hyperbilirubinemia sequelae	0	0	7	16	1	8	32
Perinatal sepsis or meningitis	4	5	8	0	0	5	22
Multiple maternal risk factors	7	1	5	0	0	1	14
Perinatal arterial stroke	4	0	0	0	0	0	4
Disorders of Post-natal onset (after Neonatal period)							
Postnatal infection - meningitis, encephalitis	4	2	1	0	0	1	8
Post natal Non- infectious cause	1	0	2	0	0	0	3
Unclassifiable or aetiology unknown	2	17	9	0	0	0	28
TOTAL	48	94	188	29	5	75	439

DISCUSSION

This study was done to estimate the prevalence of epilepsy in a cohort of children with Children with cerebral palsy who were recruited consecutively and without any selection bias when they were brought to the Developmental Paediatrics Unit for consultation. Epilepsy is one of the most common neurologic disorders of childhood and is a common accompaniment of cerebral palsy.[22]

Prevalence of Epilepsy:

In this study 169 of the total of 439 children with cerebral palsy had epilepsy and thus the prevalence of Epilepsy among children with CP in this study was 38.5% (33.9 to 43.2 95% CI). This concurs with the prevalence obtained from other similar studies.[13,48,53,56,95] However the prevalence of epilepsy among the children with cerebral palsy can be as high as 41.9-89.9%. This wide range is because of the heterogeneity of cerebral palsy in terms of its aetiology, presence of co-morbidities, extent of brain injury, socio-economic factors and the topography. Furthermore comparison of CP between various studies is difficult because of the different definitions used to diagnose CP, the age at which CP is diagnosed, and the population from which the study sample is enrolled (institution based or population based).[46] Some studies exclude acquired CP (CP which occurs after the post-natal period) since they are different from prenatal and perinatal causes. In some studies neuro-metabolic or genetic causes which present as CP are excluded. Age of diagnosis of CP is also contentious. The most severe cases can be identified by early infancy and have a high mortality rate. These children may be under represented in studies which use a higher

age cut off for diagnosis of CP. In most European studies the diagnosis is made only after the child has crossed four years.[8] By this age milder forms of CP can improve with time and so "outgrow" the diagnosis of CP and may not access disability or hospital services. Studies which are based on hospital records or hospital visits, the mild forms of CP are likely to be under-represented since they are unlikely to have problems which require any services. A population surveillance study from Atlanta showed that the prevalence of CP in the population was 1 in 1000 and epilepsy in those with CP was 46%.[96] In Low income countries, children with cerebral palsy who come to the hospital are likely to be more severely affected[45] or from higher socio-economic strata.

Demographic factors

Gender: In this study like most studies with cerebral palsy, the boys in the study outnumbered the girls.[43,53,85,96,97] Many studies have shown that males are at a disadvantage from early life and more likely to have developmental disorders However in patriarchal societies like ours, male children are preferred over girls and are more likely to be brought for treatment. Thus cultural preferences may also explain the male predominance.

Anthropometry: More than two thirds of the children had microcephaly, short stature and malnutrition in this study. There are multiple factors for poor growth in cerebral palsy – poor intrauterine growth, feeding difficulties, frequent illnesses, malnutrition, abnormal endocrine function, decreased weight bearing and neurologic factors. Assessing linear growth in CP is difficult in view of the presence of contractures.

Thus comparing CP children with normally growing peers may be inappropriate.

When we compared children who had epilepsy with those who did not have epilepsy, there was not much difference in the weight or linear growth between both groups.

However there was a significant difference in the head size, and microcephaly was more significantly associated with children with epilepsy ($p<0.001$). This could be because of combination of factors. Epilepsy in CP is more common in children with intellectual disability and is also related to the extent of brain injury, both of which are directly related to head size. Poor cognition has been associated with microcephaly and seizures in children with CP.[7]

Consanguinity: Like other studies[13] we found that epilepsy in CP is not related to parental consanguinity.

Age of inclusion: In this study children who were 12 months and above were included, which is similar to other studies.[58] By one year of age one can be reasonably sure if the illness is a static encephalopathy or if it is a progressive disorder. The median age in the study was about four years (45 – 46months) and this did not differ between those who had epilepsy and those who did not.

Aetiology of Cerebral Palsy:

Like other Indian studies, perinatal and neonatal complications were the important causes of cerebral palsy (CP). Prematurity is the most common cause in Western countries. But in developing countries the most common causes are perinatal asphyxia, perinatal and neonatal infections, kernicterus and prematurity.

The table 16 below, compares the aetiologies of CP from this study with that of a study from Australia and that of an Indian study. Some of the children had more than

one associated pathology. In both the Indian cohorts (our cohort and the Singhi cohort) perinatal asphyxia was the major cause of CP, while prematurity was much lesser. Prematurity was the major cause in the Australian cohort.

Table 16: Aetiology of Cerebral Palsy in this compared to CP cohorts from India and Australia

	This study	**Strijbis EM *et al***	**Singhi (2013)**
No. of cases	**439**	**213**	**1212**
Prematurity	18%	78%	24.3%
IUGR	4.5%	34%	Not mentioned
Intrauterine infection	1.1%	28%	Not mentioned
Kernicterus		0%	35.1%
Neonatal sepsis	5%	Not mentioned	30.6%
Low birth wt.	23%	Not mentioned	37.8%
Asphyxia	47%	2%	51.98%

In our study perinatal asphyxia was the major cause of cerebral palsy and was also the leading cause of epilepsy (107 had CP without epilepsy and 99 children had CP with epilepsy) The other important causes were prematurity (80 children) and neonatal hyperbilirubinemia (32 children). Prenatal causes like migrational and organizational disorders, Intrauterine growth restriction, neonatal hypoglycaemia, TORCH sequelae, postnatal meningitis/sepsis, and perinatal arterial stroke were fewer in number.

Other studies from developing countries have found that perinatal asphyxia and prematurity were the most common aetiologies.[13] However, Carlsson *et al* found that children with cerebral palsy with meningitis, and neurodevelopmental migrational and organizational disorders had an increased frequency of epilepsy[12].

In this study we found that asphyxia was significantly associated with the occurrence of epilepsy which is well described in other studies. We also found that prematurity seemed protective against occurrence of epilepsy (table 10).

Topography of Cerebral Palsy

In most studies spastic CP is the commonest form of CP.[48,53,59,96] In this study the most common types of cerebral palsy were quadriplegic CP (42.8%) diplegic CP (21.4%), mixed forms of CP (17.1%) and hemiplegic CP (10.9%). This could be because perinatal asphyxia was the commonest aetiology and the most common type of CP in asphyxia is quadriplegia or mixed CP. Our results were very similar to another Indian study[97] where the frequencies were as follows – Quadriplegic CP was 45%, Diplegic CP was 22%, Hemiplegic CP was 10%. Mixed CP was lesser in this study. Quadriplegia was the most common type in other studies as well[6,13,53,98] including a large study involving multiple databases from Europe[44] where 54.5% of CP children had bilateral spastic CP (quadriplegia and diplegia), 30% had hemiplegic CP and 7.2% had dyskinetic CP.

Topography of CP with relation to the frequency of epilepsy

Epilepsy is an index of the severity of brain damage in children with cerebral palsy. The highest frequency of epilepsy in this study was in those with quadriplegia (49%), followed by mixed CP (44%) and hemiplegic CP (33%). This is similar to other studies where quadriplegia and spastic hemiplegia had the highest frequency of epilepsy, compared to children with spastic diplegia or dyskinetic CP.[13,51,53,56,99] Contrarily in the study by Singhi *et al*, the prevalence of epilepsy was most among those spastic hemiplegia.[100] A large study from the SCPE network[43] also found that children with hemiplegia were more at risk to develop CP than those with diplegia since deep grey matter lesions are more often seen in hemiplegia than in diplegic CP.

However in this study children with dyskinetic CP had the highest frequency of epilepsy. These geographical variations can be explained by the varied aetiologies and co-morbidities of the study children.

Neonatal seizures and subsequent epilepsy

History of neonatal seizure is an important risk factor for the development of epilepsy in cerebral palsy and leads to poor prognosis.[13] Almost all studies have shown that children who have neonatal seizures are more likely to develop epilepsy. In our cohort 42% of those who had epilepsy had history of neonatal seizure, as compared to 18.5 % of those without epilepsy ($p<0.001$). This is similar to findings in other studies. Kwong *et al*, found higher incidence of neonatal seizures in the epilepsy group compared to that control group (19% vs. 3%)[53]. Bruck *et al* also found an increased history of neonatal seizures in the epilepsy group (48.4%) compared to the control group (8%). They also found that these children are more likely require polytherapy and had poorer progress in terms of seizure remission[45]. Zelnik *et al*. reported that 22 of 27 (81.5%) patients with cerebral palsy who had history of neonatal seizures subsequently developed epilepsy.[54]

Neonatal seizures are also associated with poorer prognosis in CP with epilepsy. In our study among the children with uncontrolled epilepsy, there was equal proportion of children who had history of neonatal seizures and children without history of neonatal seizures (both 26.5%). Neonatal seizures were however more common in those with quadriplegic CP (35.6%) followed by spastic diplegia (25%), and spastic hemiplegia (18%). Unfortunately since this was a cross sectional study we cannot comment on long term outcomes. There are studies to show that neonatal seizures

adversely affects the outcome of epilepsy in CP. In one study patients with neonatal seizure history were 3.3 times more likely to have poor epilepsy prognosis than those who had no neonatal seizure history.[13] Neonatal seizures have been found to be and important antecedent of childhood onset epilepsy[85] and an important predictor for future development of neurological sequelae.[78]

Intellectual disability and epilepsy in cerebral palsy

Intellectual disability and learning difficulties commonly accompany cerebral palsy. However an objective quantification of the Intellectual Quotient (IQ) using the usual IQ tests is often difficult in children with CP because of their multiple disabilities, communication difficulties and sensory defects. Like Singhi *et al* we used the social quotient of the Vineland Scales as a surrogate marker to assess the child's cognitive and adaptive abilities. Being a parental interview, it is also not dependent on patient compliance, which is often difficult in the children with multiple disabilities.[75]

On the whole those with both epilepsy and CP are of lower intelligence than those with no recognized seizures. Children with tetraplegia and epilepsy almost always have severe learning difficulties.[101] Almost all studies have found that CP children with epilepsy have poorer cognition than those who do not have epilepsy. Sussova *et al* reported that 63% of their hemiplegic patients were mentally retarded as compared with 16% of non-epileptic patients. Kwong and colleagues reported that even in the same form of CP such as hemiplegia, mental sub-normality was more common in children with epilepsy than in those without epilepsy.[53] In Gul Mert's study it was found that the risk of moderate or severe intellectual disability in CP children with epilepsy was 4.02 times higher than the CP children without epilepsy[13]. In our study

we had found 94.7%children among epilepsy group had SQ below 70 score, compared to 67.8%in the non-epilepsy group.[13]

Family history of seizures and risk for developing epilepsy

The presence of family history of epilepsy influences the risk of seizures in children with CP.[11] In our study children family history of seizures was significantly associated with development of epilepsy (0.7% vs. 40.2%, $p<0.001$). In the study by Curtolo, children with epilepsy were 17 times more likely than controls to have a first-degree relatives with epilepsy; those with and without cerebral malformations had 22.3 times and 14 times higher risks respectively.[85]

In Gul Mert's study, children with history of seizures in the first degree relatives had a 5.5 times increased risk of epilepsy. In Bruck's study there was 29 % family history noted in the epilepsy group as compared to 2% among the controls (CP without epilepsy)[45]

Age of onset of seizures

The median age of onset of epilepsy in our cohort was 9 months (mean of 15.6 months) and majority (67%) of the children had onset of epilepsy in the first year. This is very similar to the average age of the onset of epilepsy in Bruck's cohort which was 12.6 months[45]. In our study the first seizure occurred during the first year of life in 74.2% of the patients. This is very similar to Zafeiriou's cohort where 71% had seizures before one year of age.[102] In Singhi's study the mean age of onset of seizures was 18.9 months and 61% of the children had their first seizure before 1 year of age.[86] In Kwong's cohort 47% developed epilepsy in the first year. Children with

CP have a significantly earlier onset of seizures, compared to non-CP controls with epilepsy. [48,53]

The age of onset of seizure shows a close correlation with underlying neurologic abnormalities and varies depending upon the topography.[53] For instance Carlsson reported that seizures started at 6 months in quadriparetic cerebral palsy, 12 months in diparetic cerebral palsy, and 2.5 years in hemiparetic cerebral palsy. In our cohort children with spastic quadriplegic had the earliest onset and started at a median age of 7.5 months (mean age-13.6 months).[12] The median ages of onset of the other forms were as follows – 8 months for hemiplegic CP (mean-16 months), 9 months for dyskinetic CP (mean-13.4 months), 12 months for mixed CP (mean - 16.3 months) and median of 14.5 months (mean – 23 months) for diplegic CP. The difference in the ages of onset in diplegic and hemiplegic CPs again may be because of the difference in the cerebral lesions which resulted in the epilepsy.[12]

In Singhi's study social quotient values were found to have a positive correlation with age of onset of seizures, that is, the higher the age of onset of seizures, the higher the social quotient ($p < .01$)[5,8] Similarly in our although the mean age of onset of seizures in those with SQ of >70 was higher compared to those with SQ of <70 (23.1 vs. 15.2 months), because of the wide variability in the ages we could not show any statistical significance.[58]

Epilepsy semiology:

In our study generalized seizures (tonic, clonic seizures) comprised 55%, myoclonic seizure (including infantile spasms) comprised 36% and partial seizure comprised 9% of the seizure patterns. Myoclonic seizures are also commonly seen in cerebral palsy.

In our study it was the second most important type after generalized seizures and comprised more than one-third of the epilepsies. Our results are comparable to Singhi's study in which generalized seizures were the most common and about one fourth had infantile spasms and 14.3% had myoclonic jerks.[75] These figures also match those of Hadjipanayis *et al*, who reported generalized seizures in 36.8%, West's syndrome in 15.6%, and myoclonic jerks in 10.6%.[103] However in Singhi's and Hadjipanayis cohorts the frequency of partial seizures was higher compared to ours.[104] Our study matched Singhi's cohort in that no case of absence seizures. Generalized seizures were the most common in other studies.[13,45]

In Singhi's study generalized seizures were the most common in spastic quadriplegia and diplegia, whereas partial seizures were the most common in children with hemiplegia.[95] Similarly in another study[59] in children with hemiplegia, partial seizures were predominant type (73%) of epilepsy, while in diplegic CP, generalized tonic – clonic seizures were the main form (54%) of epilepsy. However, in our study generalized seizures were the predominant type in all types of cerebral palsy (62.5% in hemiplegic CP, 75%, in diplegic CP, and 52% in quadriplegic CP).

In contrast there are studies where, focal or secondary generalized seizures were reported to be more common than primary generalized seizures. In their study Carlsson *et al* found partial seizures were the dominant form in all spastic CP types.[12]

EEG Abnormalities:

Although EEG is not mandatory in the diagnosis of CP, it has been advised that the EEG should be obtained when a child with CP has a history or examination features suggesting the presence of epilepsy or an epileptic syndrome.[57] Studies have reported

EEG abnormalities between 66-92.6% .[13,48,58,73] This matches with our results where 68.6% of the children with epilepsy and had abnormal inter-ictal EEG while remaining 31.4% were normal. Nearly half (46%) of the total patients with epilepsy had generalized epileptiform activities, 17% had focal epileptiform activities and hypsarrhythmia was observed in about 5%. Similarly Al Suleiman in a study of EEG pattern in epilepsy in CP found that majority (59%) of their patients had generalized epileptiform activity, focal epileptiform activities in 15% of the patients 5% had hypsarrhythmia. But in Al Suleiman's study only 20% of the EEGs were normal. However in some studies EEG abnormalities are found in more than 90% of the CP children with epilepsy.[13,47]

Our study matched Singhi's study where 70.5% of the EEGs were abnormal. In this study, 42% of the patients had generalized epileptiform activities and 12.3% had focal epileptiform activities. Because of the predominance of generalized epileptiform activities in our study, we did not notice any preferential EEG patterns between the different topographies. The variations in the EEG patterns and the seizure patterns among the different studies could also be due to the differences between populations and the type and extent of brain injuries.

Response to Antiepileptic therapy

Seizures were controlled in 124 children (73.4%) in our study while in Singhi's study seizures were controlled in 58.1%[95], in Kwong's study seizures were controlled in 37%[53], in Gul Mert's study it was controlled in 52%[13], and was 38% in the study by Carlsson. However, since this study was a cross sectional study we can never be sure that the seizures will continue to be under control in the future[55].

Seizure control in our study among the various types of CP was as follows: hemiplegia-100%, diplegia -90%, mixed CP-73.5% and quadriplegia 64%. In Singhi's study seizure control was achieved in 75% of the cases of hemiplegia, and in only half of the children with quadriplegia and diplegia[58].

In our study factors significantly ($p<0.05$) associated with poor seizure control were non-ambulant status (GMFCS Levels III-V), abnormal EEG findings and polytherapy. However this being cross-sectional data, it was not possible to decide on the direction of the association (whether uncontrolled epilepsy preceded these factors or vice versa).

Seizures were more uncontrolled in those with myoclonic seizures (49% vs. 31%).

In our study seizures were controlled with monotherapy in 62 children (37%) and remaining 61% (103 children) required multiple drugs for controlling their seizures. There were also 4 children who had been on medication in the past whose seizures were now well controlled. Similar to other studies,[53,90] we found that polytherapy was more common among those with spastic quadriplegia. In our study 67.3% of the quadriplegic children required polytherapy. In terms of the semiology polytherapy was required in 56.2% of children with hemiplegia, 52% of children with diplegia, 53% of children with mixed CP and 43% of children with dyskinetic CP. In terms of the EEG abnormalities polytherapy was required in 57% of children with generalized seizures, 74% of children with myoclonic seizures (which included infantile spasms) and 40% of children with partial seizures.

The findings in our study differed from that of Singhi. In their study polytherapy was required in only 38.1% of the patients. Compared to our study, polytherapy was much

lesser (35.2%) in children with quadriplegia and hemiplegia (25%) while it was almost the same with children with diplegia (50%). Polytherapy was most often required in cases with infantile spasms (58.3%), followed by other types of myoclonic epilepsy (46.7%) and partial (46%) and generalized seizures (30%).

Other studies have also found an increased proportion of children on polytherapy. In the study by Aksu *et al* study 89.2% of the children were on polytherapy and in Kwong's study 59.5% of the children were on polytherapy.

Epilepsy and its association with GMFCS scoring

In our study as the GMFCS score increased, the prevalence of epilepsy also increased and this was highly significant. This is because GMFCS score may be an indicator of the extent of brain injury (higher the GMFCS and more the injury). Only Gul Mert has used the GMFCS scoring for quantifying the extent of CP and they did not find any increasing trend.[13]

MRI in children with Cerebral Palsy

CP is a clinical diagnosis, based upon neurological symptoms of a motor disorder causing activity limitation. Although neurological findings may be similar in various cerebral palsy syndromes, etiological underpinnings may be diverse. As a generality, children with spastic syndromes often show white matter injury or grey matter involvements, whereas extrapyramidal syndromes frequently have basal ganglia abnormalities on imaging. Neuroimaging particularly is recommended in the evaluation of a child with CP if the aetiology has not been established.[57] Data from studies involving 644 children with CP who had MRI scans found abnormalities in

89% of the scans.[99] Neuroimaging helps understanding of pathogenesis and, to a minor extent, also aetiology of the underlying brain disorder .[36]

The Surveillance for Cerebral palsy in Europe (SCPE) has developed a classification system for the reporting of brain abnormalities identified by means of MRI in children with CP: the MRI classification system (MRICS).[72] The MRICS is a qualitative classification system for cerebral palsy describing pathogenic neuroimaging patterns related to timing of brain injury.

In this cohort 302 (68.7%) of the children had MRI scans and the findings were classified according to the MRICS. The predominant lesions were periventricular leukomalacia (36%), basal ganglia and thalamic lesions (23.8%) cortical and sub-cortical lesions (17.5%) and malformations (4.6%).Our results can be compared to a study by Bax and colleagues where the MRI scans showed that periventricular leukomalacia (PVL), was the most common finding (42.5%), followed by basal ganglia lesions (12.8%), cortical/subcortical lesions (9.4%), malformations (9.1%), focal infarcts (7.4%), and miscellaneous lesions (7.1%). 11.7% of these children had normal MRI findings.

The higher proportion of basal ganglia lesions in our study compared to the Bax study was because of the higher number of children with kernicterus and perinatal asphyxia in our study. The higher percentage of perinatal asphyxia in term infants could have contributed to the higher proportion of subcortical/cortical lesions in our study.

Complications of Cerebral palsy

CP is essentially a disorder of motor impairment, other neurologic disabilities frequently co-occur in the setting of CP. These include significant developmental

delay in other domains (global developmental delay), frank cognitive impairment (mental retardation), primary sensory impairments (visual and/or auditory), learning disorders (learning disability, attention deficit hyperactivity disorder) and epilepsy (of all types). Indeed, these other neurologic disabilities, not the motor impairment, may be the major challenge facing the child and family.[105]

In our study there were multiple complications. Most of them did not differ significantly between the children with epilepsy and those without epilepsy. However a few of these complications namely - presence of visual impairment, swallowing difficulties and drooling and the presence of autistic symptoms were significantly higher in the children with epilepsy.

CONCLUSIONS

In conclusion the main findings of this study were the following:

- The prevalence of Epilepsy among children with CP in this study was 38.5% (33.9 to 43.2 95% CI).
- The median age of onset of epilepsy in our cohort was 9 months (mean of 15.6 months) and majority (67%) of the children had onset of epilepsy in the first year.
- More than two thirds of the children had microcephaly, short stature and malnutrition in this study
- Microcephaly was more significantly associated with children with epilepsy ($p<0.001$) but short stature or malnutrition was not significantly different between the children with epilepsy and children without epilepsy.
- Perinatal and neonatal complications were the important causes of cerebral palsy (CP) in this study
- The predominant type of CP was spastic CP and among the spastic CPs, quadriplegic CP was the most common. This was followed by mixed cerebral palsy (combination of both spastic and dyskinetic CP).
- The highest frequency of epilepsy in this study was in those with quadriplegia (49%), followed by mixed CP (44%) and then hemiplegic CP (33%).
- History of neonatal seizure is significantly associated with occurrence of epilepsy in CP ($p<0.001$)
- Family history of epilepsy is significantly associated with development of epilepsy

- Majority of the children with CP had a social quotient (SQ) of <70. In our study we had found 94.7% children among epilepsy group had SQ below 70 score, compared to 67.8% in the non-epilepsy group ($p<0.001$)
- Generalized seizures comprised 55%, myoclonic seizure (including infantile spasms) comprised 36% and partial seizure comprised 9% of the seizure patterns.
- Abnormal inter-ictal EEG was present in 68.6% of the children with epilepsy. Nearly half (46%) of the total patients with epilepsy had generalized epileptiform activities, 17% had focal epileptiform activities and hypsarrhythmia was observed in about 5%. The remaining 31.4% had normal EEG.
- Seizures were controlled in 124 children (73.4%) Factors significantly ($p<0.05$) associated with poor seizure control were non-ambulant status (if the GMFCS level was III and above), abnormal EEG findings and polytherapy. There was a higher proportion of myoclonic seizures which was uncontrolled
- The prevalence of epilepsy increased with worsening of the GMFCS score ($p<001$)
- Among the children who had MRI the predominant lesions were periventricular leukomalacia (36%), basal ganglia and thalamic lesions (23.8%) cortical and sub-cortical lesions (17.5%) and malformations (4.6%).
- The study children had multiple co-morbidities. Presence of visual impairment, swallowing difficulties and drooling and the presence of autistic symptoms were significantly higher in the children with epilepsy.

LIMITATIONS OF THE STUDY

- This being cross sectional study, information about risk factors were limited by the study design. Cross sectional studies are affected by the antecedent-consequent bias and therefore on many occasions it is difficult to determine whether the risk factor preceded the disease or vice versa, since both are ascertained at the same time. From other studies (cohort and case-control studies of Epilepsy in Cerebral Palsy) we identified certain risk factors and looked at the relationship between these risk factors and the outcome (epilepsy). The risk factors which we identified are likely to predispose to epilepsy.
- Only children who already had epilepsy were included into the "epilepsy" group. It is likely that children who did not have epilepsy at the time of inclusion, could have developed seizures at a later time.
- This is a hospital cohort and unlike population based studies, children who come to the hospitals may be either severely impaired or may be from higher socio-economic strata. This is likely to bias some of the results of this study.

Despite its limitations, because of the large sample size, this study provides valuable information about epilepsy in cerebral palsy. Epilepsy is a common accompaniment of cerebral palsy and its presence complicates a relatively static problem. Co-occurrence of epilepsy increases the risk of cognitive problems, worsens daily living skills, ambulation, and sensory impairments and contributes significantly to behaviour problems. This imposes a greater burden of care. Both the diagnosis and management of associated epilepsies require skills additional to those needed for uncomplicated

CP. Since the presence of epilepsy adversely affects the prognosis, long term follow up is required for children with cerebral palsy who have epilepsy.

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APPENDICES

1. **DEFINTIONS OF TERMS USED IN THE STUDY**
2. **INSTITUTIONAL REVIEW BOARD APPROVAL**
3. **PARENTAL CONSENT FORM**
4. **DATA COLLECTION PROFORMA**
5. **POSTER PRESENTED AT PEDICON 2017, BENGALURU (January 2017)**

DEFENITIONS of TERMS USED IN THE STUDY

CEREBRAL PALSY (1)

CP is a group of disorders

- it involves a disorder of movement and posture and of motor function;
- it is permanent but not unchanging;
- it is due to a non-progressive interference/lesion/abnormality;
- this interference/lesion/abnormality is in the developing/immature brain.

Excluded are:

- All progressive conditions resulting in loss of acquired skills; spinal diseases;
- Cases with hypotonia as the sole neurological finding.

SPASTIC CEREBRAL PALSY (1)

Spastic CP is characterized by at least two of:

- Abnormal pattern of posture and/or movement
- Increased tone (not necessarily constant)
- Pathological reflexes (increased reflexes: hyperreflexia and/or pyramidal signs e.g. Babinski response

Spastic CP can be Diplegic, Hemiplegic or Quadriplegic

DIPLEGIC CEREBRAL PALSY

Spastic CP characterized by predominant involvement of lower limbs

HEMIPLEGIC CEREBRAL PALSY

Spastic CP characterized by predominant involvement of limbs on one side of the body

QUADRIPLEGIC CEREBRAL PALSY

Spastic CP characterized by involvement of limbs on both sides of the body

ATAXIC CEREBRAL PALSY (1)

Ataxic CP is characterized by both:

- Abnormal pattern of posture and/or movement
- Loss of orderly muscular coordination so that movements are performed with abnormal force, rhythm, and accuracy

DYSKINETIC CERBRAL PALSY (1)

Dyskinetic CP is dominated by both:

- Abnormal pattern of posture and/or movement
- Involuntary, uncontrolled, recurring, occasionally stereotyped movements

Dyskinetic CP may be either dystonic or choreo-athetotic

DYSTONIC CEREBRAL PALSY(1)

Dystonic CP is dominated by both:

- Hypokinesia (reduced activity, i.e. stiff movement)
- Hypertonia (tone usually increased)

CHOREOATHETOTIC CEREBAL PALSY (1)

Choreo-athetotic CP is dominated by both:

- Hyperkinesia (increased activity, i.e. stormy movement)
- Hypotonia (tone usually decreased)

MIXED TYPE(2)

CP in which there is more than one type (spastic, dyskinetic or ataxic) and none are more dominant than the other)

EPILEPSY (3)

Defined as the occurrence of at least two unprovoked seizures occurring >24 h apart

DRUG RESISTANT EPILEPSY (4)

Failure of adequate trials of two tolerated and appropriately chosen and used AED schedules (whether as monotherapy or in combination) to achieve seizure freedom

BIRTH ASPHYXIA (5),(6),(7)

ACOG definition:

When the neonate meets all of the following conditions:

i. umbilical cord arterial pH less than 7 (whether metabolic or mixed)
ii. Apgar score of 0 to 3 for longer than 5 minutes
iii. neurologic manifestations (eg, seizures, coma, or hypotonia), and
iv. multi-systemic organ dysfunction

WHO definition:

Definition I (For extramural babies)

Moderate birth asphyxia: Slow gasping breathing at 1-minute of age.

Severe birth asphyxia: No breathing at 1-minute of age.

Definition II (For intramural babies)

Birth asphyxia: Apgar score of less than 7 at 1 minute of age

Moderate birth asphyxia: Apgar score between 4 to 6 at 1-minute of age

Severe birth asphyxia: Apgar score of 3 or less at 1-minute of age.

SEARCH Criteria (for verbal autopsy)

- Did not cry after birth for more than 3 minutes or did not breathe or had slow gasping respiration at birth
- Drowsy or unconscious or convulsion at birth or within 72 hours
- Generalized flaccidity at birth or within 72 hours in a full term baby

PRETERM (6)

Gestational age of less than 37 completed weeks (i.e. less than 259 days)

TERM (6)

Gestational age of 37 to less than 42 completed weeks (i.e. 259 to 293 days)

POST TERM (6)

Gestational age of 42 completed weeks or more (i.e. 294 days or more).

PERINATAL PERIOD (6)

Commences from 22 weeks (154 days) of gestation (the time when the birth weight is 500 g), and ends at 7 completed days after birth

GLOBAL DEVELOPMENTAL DELAY (8)

Global developmental delay is as significant delay (performance two standard deviations or more below the mean on age-appropriate, standardized norm-referenced testing) in two or more of the following developmental domains: gross/fine motor, speech/language, cognition,

social/personal, and activities of daily living.

CEREBRAL VISUAL IMPAIRMENT (9)

Visual dysfunctions caused by damage to, or malfunctioning of, the retro-chiasmatic visual pathways in the absence of damage to the anterior visual pathways or any major ocular disease

NEONATAL HYPOGLYCEMIA (10)

Hypoglycemia in term infants has been defined as a blood glucose value of less than 35 mg/dL or as a plasma glucose value of less than 40 mg/dL.

HYPOCALCEMIA (6)

Any one of the following:

Serum total calcium <7 mg/dl. or

Serum ionized calcium <4 mg/dl.

SEPTICEMIA (SYSTEMIC BACTERIAL INFECTION) (6)

In an infant having clinical picture suggestive of septicemia, the presence of any one of the following criteria:

- Existence of predisposing factors: maternal fever or foul smelling liquor or prolonged rupture of membranes (>18 hrs) or gastric polymorphs (>5 per high power field).
- Positive septic screen (two of the four parameters (namely, TLC (<5000/mm, band to total polymorph ratio of > 0.2, absolute neutrophil countless than 1800 / cumm, C-reactive protein >1mg/dl and micro ESR>10 mm 1st hour).
- Radiological evidences of pneumonia.
- Isolation of pathogens from blood or any other body fluid (urine, CSF)

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OFFICE OF RESEARCH
INSTITUTIONAL REVIEW BOARD (IRB)
CHRISTIAN MEDICAL COLLEGE, VELLORE, INDIA

Dr. B.J. Prashantham, M.A., M.A., Dr. Min (Clinical)
Director, Christian Counseling Center,
Chairperson, Ethics Committee.

Dr. Alfred Job Daniel, D Ortho MS Ortho DNB Ortho.
Chairperson, Research Committee & Principal

Dr. Nihal Thomas,
MD, MNAMS, DNB (Endo), FRACP (Endo), FRCP (Edin), FRCP (Glasg)
Deputy Chairperson,
Secretary, Ethics Committee, IRB
Additional Vice-Principal (Research)

January 30, 2016

Dr. Murugan T P ,
PG Registrar,
Department of Pediatrics,
Christian Medical College,
Vellore 632 004.

Sub: **Fluid Research grant project NEW PROPOSAL:**
A prospective observational cohort study to determine prevalence and risk factors of epilepsy in children with cerebral palsy.
Dr. Murugan T P (Employment Number:29467), Pediatrics, Dr. Samuel Philip Oommen (Employment Number:28217), Developmental Pediatrics unit, Dr. Sangeetha Y, Assoc. Professor, Dept. of Neurological Sciences 33557 , Dr. Maya Thomas, Professor, Dept. of Neurological Sciences 14967 , Dr. Susan Zachariah, Asst. Professor, Developmental Pediatrics Unit 28959, . Dr. BeenaKoshy, Professor and HOU, Developmental Pediatrics Unit 28418 , Dr. Sniya Valsa Sudhakar, Associate Professor, Department of Radiology 31782 , Dr. Srinivas Raghavan Asst.Professor Developmental Paediatrics 33978 , Dr. Archana Suryaprakash Tutor Developmental Paediatrics 29067 Ms. Meenatchi Papanasam, Social Worker, DVP 53367 Ms. Swathi T.O, Psychologist, DVP 33825 , Dr. Antonisamy B. Professor and HOD Biostatistics 03090

Ref: IRB Min No: 9781 [OBSERVE] dated 03.12.2015

Dear Dr. Murugan T P,
The Institutional Review Board (Blue, Research and Ethics Committee) of the Christian Medical College, Vellore, reviewed and discussed your project titled "A prospective observational cohort study to determine prevalence and risk factors of epilepsy in children with cerebral palsy." on December 03rd 2015.

I enclose the following documents:-
1. Institutional Review Board approval 2. Agreement

Could you please sign the agreement and send it to Dr. Nihal Thomas, Addl. Vice Principal (Research), so that the grant money can be released.

With best wishes,

Dr. Nihal Thomas
Secretary (Ethics Committee)
Institutional Review Board

Dr NIHAL THOMAS
MD.,MNAMS,DNB(Endo),FRACP(Endo),FRCP(Edin) FRCP(Glasg)
SECRETARY - (ETHICS COMMITTEE)
Institutional Review Board,
Christian Medical College, Vellore - 632 002.

Cc: Dr. Samuel Philip Oommen, Developmental Paediatric Unit, CMC

Ethics Committee Blue, Office of Research, 1st Floor, Carman Block, Christian Medical College, Vellore, Tamil Nadu 632 002
Tel: 0416 – 2284294, 2284202 Fax: 0416 – 2262788, 2284481 E-mail: research@cmcvellore.ac.in

DEVELOPMENTAL PAEDIATRICS UNIT

CHRISTIAN MEDICAL COLLEGE, VELLORE

Informed Consent form to participate in a research study

A CROSS SECTIONAL STUDY DONE TO DETERMINE THE PREVALENCE, DESCRIBE THE CLINICAL PROFILE AND INDENTIFY THE RISK FACTORS OF EPILEPSY IN CHILDREN WITH CEREBRAL PALSY (EPIC Study)

Name of parent/guardian: _____

Date: _____

Name of child: _____

Boy or Girl _____

Date of birth:

Address: _____

(i) I confirm that I have read and understood the information sheet ,. I understand the purpose of the study and I have had opportunity to ask questions [ ]

(ii) I understand that my child's participation in the study is voluntary and that I am free to withdraw my child from the study at any time, without giving any reason, without my medical care or legal rights being affected. [ ]

(iii) I understand that the Sponsor of the clinical trial, others working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my child's health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my child's identity will not be revealed in any information released to third parties or published. [ ]

(iv) I give permission to use my use the information regarding my child's information data and developmental assessment for scientific purposes.[ ]

(v) I agree to permit my child participate in this study.[ ]

Signature of Parent or Caregiver/ Thumb impression of parent or caregiver:

Name of the Parent/ Caregiver:

Signature of the person taking consent:

Name of the person taking consent

Signature of Witness/ Thumb impression of witness:

Name of the Witness:

Date Vellore

DEVELOPMENTAL PAEDIATRICS UNIT

CEREBRAL PALSY DATA COLLECTION

sno SERIAL NO _____

hno HOSPITAL NO _____

name NAME OF THE CHILD _____

dob DATE OF BIRTH _____

age AGE OF THE CHILD _____

sex CHILD'S GENDER _____ (1-boy, 2-girl)

momedu MOTHER'S EDUCATION_____(1: Illit 2: 0-4 3: 5-8 4: 9-10 5: 11-12 6: graduate 7: PG)

patedu PATERNAL EDUCATION _____(1: Illit 2: 0-4 3: 5-8 4: 9-10 5: 11-12 6: graduate 7: PG)

modkuppscore MODIFIED KUPPUSAMY SCORE_____(1: Less than 5 2:5-10 3:11-15 4: 16-25 5: 26-29)

MATERNAL, ANTENATAL, FAMILY HISTORY

yom YEARS OF MARRIAGE ---------- (1: less than 10 years, 2: more than 10 years)

consang CONSANGUINITY ---------- (1: if consanguineous, 2: if not consanguineous)

living LIVING CHILDREN ---------- (1: zero, 2: one, 3: two, 4: three, 5: more than three)

neodeath IUD, NEONATAL,PERINATAL DEATHS ---------- (1: zero, 2: one, 3: two, 4: three or more)

abort ABORTIONS ---------- (1: zero, 2: one, 3: two, 4: three, 5: more than three)

sibcomp ANY COMPLICATIONS/DEATH IN SIBLINGS ---------- (1: No 2: Yes)

momref MATERNAL RISK FACTOR DURING PREGNANCY ---------- (1 No Risk Factors 2:Present)

(Risk Factors like maternal hypothyroidism, diabetes, PIH, IUGR, Bleeding)

family FAMILY HISTORY ---------- (1: No family history 2: Family history of developmental delay,

autism, CP Down, GDD, seizure, visual, hearing impairment, scholastic difficulties, speech delay)

antescan ANTENATAL SCAN ---------- (1: Normal antenatal scans 2: Abnormality in fetus)

fluidlev AMNIOTIC FLUID LEVEL ---------- (1: Normal Amniotic Fluid 2: Oligohydramios

3:Polyhydramnios)

DEVELOPMENTAL PAEDIATRICS UNIT

LABOUR AND DELIVERY

complabor COMPLICATIONS DURING LABOUR ---------- (1:No complications 2: Complicated Labour – prolonged more than 12 hrs, obstructed labor, abnormal presentation, cord around neck, others)

msaf MECONIUM STAINED AF ---------- (1:Nil or mild 2: Thick Meconium 3:Chorioamnionitis)

delivery TYPE OF DELIVERY --------- (1: Normal 2: Cesarean 3: Breech Extraction 4: Forceps 5:Suction)

momcomp MATERNAL INTRAPARTUM COMPLICATIONS ---------- (1: No 2: Present)

pob PLACE OF BIRTH ---------- (1:Tertiary Level Hospital 2:Secondary/Nursing Home 3:Primay 4:Home)

BIRTH AND NEONATAL HISTORY -1

pob PLACE OF BIRTH ---------- (1: Inborn 2: Outborn)

birthwt BIRTH WEIGHT ---------- (Wt. in grams) (not sure, but small enter 1999, normal 2999, large 3999)

twin MULTIFETAL GESTATION ---- (1: Singleton 2: Twin pregnancy 3: Triplets or more)

hc HEAD CIRCUMFERENCE --------- (HC in cm) (not sure but if small enter 30.9, if normal 33.9, If large 36.9)

ga GESTATIONAL AGE ---------- (GA in weeks)

length LENGTH ---------- (length in cm) (not sure but if small enter 35.9, if normal 45.9, if large 50.9)

abnormal ANY STRUCTURAL ABNORMALITY ---------- (1:No structural abnormality 2: present)

birthcry TIME TO CRY AFTER BIRTH ---------- (1: < 5 mins 2: 5-10 mins 3: 10-20 mins 4: > 20 mins)

apgar APGAR AT FIVE MINUTES ---------- (99 if not known)

color ABNORMAL COLOUR AT BIRTH ---------- (1: No 2: Cyanosis 3: Pale)

flopbirth FLOPPY AT BIRTH ---------- (1: Not Floppy at birth 2: Floppy)

dbf TIME TO ESTABLISH BREAST FEEDS IN HOURS ---------- (1: l< 6 hours 2: 6 to 12 hours 3: 12 to 24 hours 4: After 24 hours 5: not given)

neoseize ANY NEONATAL SEIZURES ---------- (1:Absent 2: Present, any Etiology or Hypoglycemia Hypocalcaemia or Asphyxia)

timerefer TIME REQUIRED REFERRAL TO HIGHER CENTRE/NICU --------- (1: Not referred 2: Referred within 6 hrs 3: Referred within 6-12 hours 4: referred with 12-24 hours 5: referred after 24 hours)

durnicu DURATION OF NICU/ SPECIALISED NEONATAL CARE IN DAYS ----------

DEVELOPMENTAL PAEDIATRICS UNIT

NEONATAL HISTORY - 2 (when not known mark 9)

asphyx PERINATAL ASPHYXIA ---------- (1:No asphyxia 2: present)

resusc RESUSCITATION ---------- (1:none 2:Bag and mask 3:intubation 4:intubation and compression)

hie HIE SARNAT stage ---------- (1: Sarnat stage 1 2: stage 2 3: stage3 9: if not known)

oxygen OXYGEN GIVEN --------- (1: No oxygen given 2: Given for less than 24 hrs 3: More than 24 hrs)

respcomp RESPIRATORY COMPLICATIONS ---------- (1:No resp. comp. during NICU stay 2: present)

vent VENTILATION ---------- (1: No CPAP/Ventilator 2: CPAP/Ventilator used)

durvent DURATION OF VENTILATION ---------- (Duration in Hours.Mins)

shock SHOCK ---------- (1: No Shock 2: Shock requiring Inotropes)

sepsis SEPSIS ---------- (1: No sepsis 2: Suspected sepsis (antibiotics without organ)
3: Definite septicemia 4: Meningitis 5: Septicemia with complication)

arf ACUTE RENAL FAILURE ---------- (1:No ARF 2: ARF present)

polycyth POLYCYTHEMIA ---------- (1:Polycythemia absent 2: Polycythemia present)

anemia ANEMIA ---------- (1:Anemia absent 2: Anemia present)

lowplat THROMBOCYTOPENIA ---------- (1:Thrombocytopnia absent 2: Thrombocytopenia present)

hypogly HYPOGLYCEMIA ---------- (1:No hypoglycemia 2: Asymptomatic 3: Symptomatic)

hypocal HYPOCALCEMIA ---------- (1:No hypocalcemia 2: Asymptomatic 3: Symptomatic)

hyperbil HYPERBILIRUBINEMIA ---------- (1: No jaundice 2: Phototherapy 3: Exchange Transfusion)

cholest CHOLESTATIC JAUNDICE ---------- (1: No cholestatsis 2: Neonatal hepatitis 3: Biliary atresia
4: Other causes of cholestasis or Elevated Liver Enzymes)

lma LATE METABOLIC ACIDOSIS ---------- (1: Late Metabolic Acidosis Absent, 2: present)

ostopen OSTOPENIA OF PREMATURITY ---------- (1: No Osteopenia, 2: Present)

pda PATENT DUCTUS ARTERIOSUS ---------- (1: No PDA, 2: Closed with drugs, 3: Surgical closure)

nec NECROTISING ENTEROCOLITIS ---------- (1: No NEC, 2: Bell stage 1, 3: Stage 2, 3: Stage 3)

heart CARDIAC COMPLICATIONS ---------- (1: NO cardiac complications, 2: CCF, 3: Others)

gec G.I COMPLICATIONS (OTHER THAN NEC) ---------- (1: No GIT complications, 2: present)

ivh INTRAVENTRICULAR HEMORRHAGE ------- (1: No IVH, 2: Grades 1 or 2 3: Grades 3 or4 9: No scan)

rop RETINOPATHYOF PREMATURIY ------ (1: No ROP /self limited 2: ROP requiring treatment 9: not done)

pvl PERIVENTRICULAR LEUKOMALACIA ---------- (1: No PVL, 2: de Vries Grade1, 3: Grade 2, 4: Grade 3)

neocomp ANY MAJOR NEONATAL COMPLICATON (as given above) ---------- (1: No, 2: Yes)

DEVELOPMENTAL PAEDIATRICS UNIT

DEVELOPMENTAL HISTORY - 1

walkdel DELAY IN WALKING ---------- (1: No Delay in walking 2: Delayed Walking)

spkdelay DELAY IN SPEAKING SPECIFIC WORDS ---------- (1: No Delay in speaking 2: Delayed Speaking)

spastic PRESENCE OF STIFFNESS IN LIMBS NOTICED ---------- (1: No Spasticity 2:Spastic)

floppy PRESENCE OF FLOPPINESS IN LIMBS NOTICED ---------- (1: Not Floppy 2: Floppy)

abnmove ANY ABNORMAL MOVEMENTS -DYSTONIA, CHOREA ---------- (1: No Abnormal movements 2: Present)

DEVELOPMENTALMILESTONES:(IFNOT ATTAINED FILLOO)

smile AGE OF SOCIAL SMILE IN MONTHS ----------

headcont AGE OF HEAD CONTROL IN MONTHS ----------

sitting AGE OF SITTING INDEPENDENTLY IN MONTHS ----------

standing AGE OF STANDING INDEPENDENTLY IN MONTHS ----------

walking AGE OF WALKING INDEPENDENTLY IN MONTHS ----------

grasp AGE OF REACHING AND HOLDING OBJECTS ----------

speaking AGE OF SPEAKING FEW WORDS IN MONTHS ----------

CURRENT DEVELOPMENT(from Development Chart)

nowgm NOW GROSS MOTOR ---------- (Age in Months)

nowfm NOW FINE MOTOR ---------- (Age in Months)

nowlang NOW LANGUAGE ---------- (Age in Months)

nowsc NOW SELF CARE ---------- (Age in Months)

nowply NOW PLAY ---------- (Age in Months)

ANTHROPOMETRY DETAILS

hc HEAD CIRCUMFERENCE ----------

Wt WEIGHT ----------

Lt LENGTH ----------

muac MID UPPER ARM CIRCUMFERENCE ----------

zwtforht Z-SCORE OF WEIGHT FOR LENGTH ----------

zwtforage Z-SCORE OF WEIGHT FOR AGE ----------

zhtforage Z-SCORE OF LENGTH FOR AGE ----------

zbmi Z-SCORE OF BMI FOR AGE ----------

zhc Z-SCORE OF HC FOR AGE ----------

DEVELOPMENTAL PAEDIATRICS UNIT

CEREBRALPALSY DETAILS:

(Even if abnormal tone and movements are present in only one limb, must be scored as present)

Limbuse ANY WEAKNESS ON ANY SIDE ---------- (10: uses all 4 limbs 20: Right Hemiplegia 21: Right Monoplegia 30: Left Hemiplegia 31: left Monoplegia 40: Diplegia 50: Right Triplegia 51: Left Triplegia 60: Quadriplegia)

spastic SPASTICITY PRESENT ---------- (1: No Spasticity 2: Spasticity present 3; Not sure)

dystonia DYSTONIA ---------- (1: No Dystonia 2: Dystonia present 3: not sure)

choreo CHOREOATHETOID ---------- (1: No Choreoathetoid movements 2: Present 3: not sure)

dyskinesia DYSKINESIA AND INVOLUNTARY MOVEMNTS ---------- (1: No Dyskinetic / involuntary Movements 2: Present 3: not sure)

ataxia ATAXIA ---------- (1: no ataxia 2: Ataxia present 3: Not sure)

cerebel CEREBELLAR SIGNS OTHER THAN ATAXIA, HYPOTONIA ---------- (1: None 2: Nystagmus, past pointing, others 3: Not sure)

stereomove STEREOTYPIC MOVEMENTS ---------- (1: No stererotypy 2: Stereotypic movements present)

cptype TYPE OF CP ---------- (1:Spatic 2: Dystonic 3: Choreoathetoid 4: Ataxic 5: Mixed 6:Hypotonic)

mobility MOBILITY PATTERN ---------- (1: Normal walking 2: Walking with walker/hand held/cruising 3: Bottom shuffling 4: Crawling (bear) 5: Commando crawl 6: Crouch 7: Bedridden)

hmf HIGHER MENTAL FUNCTION --------- (1: Appropriate for age - within 25% of age 2:Compromised)

neurocut SIGNIFICANT NEUROCUTANEOUS MARKERS ---------- (1: No significant markers 2:Present)

cninv CRANIAL NERVE INVOLVEMENT ---------- (1: Yes and 2: No)

dysmorph DYSMORPHISM ---------- (1: No Dysmorphism 2: Dysmorphic)

eyes EYES INVOLVEMENT ---------- (1: No eye involvement 2: Eyes involved - squint, refractive, CVI, cataract, others)

cvi CORTICAL VISUAL IMPAIRMENT ---------- (1: No CVI 2: CVI present)

drooling DROOLING ---------- (1: No drooling 2: Drooling present)

swallow SWALLOWING DIFFICULTY ---------- (1: No swallowing difficulty 2: Present) caries

DENTAL CARIES ---------- (1: No dental caries 2: Caries present)

chest CHEST ILLNESS ---------- (1: No LRI 2: LRI present)

hipdis HIP DISLOCATION ---------- (1: No hip dislocation 2: Hips subluxated 3: Hips dislocated)

spine SPINE ---------- (1: No spine problem 2: Kypohosis, Scoliosis, Gibbus)

behavior BEHAVIOURABNORMALITIES ---------- (1: Normal behaviour 2: Abnormal behaviourotherthan autism)

ftt FAILURE TO THRIVE (FTT) ---------- (1: No FTT 2: FTT present)

contract CONTRACTURES ---------- (1: No Contracture 2: Contractures present)

urine BLADDER ABNORMALITIES ---------- (1: No bladder abnormalities 2: Bladder abnormal)

bowel BOWEL ABNORMALITIES ---------- (1: No bowel problems 2: Constipation present 3: Others present)

hearing HEARING IMPAIRMENT ---------- (1: Normal hearing 2: Unilateral hearing impairment 3: Bilateral Hearing loss)

autism AUTISM ---------- (1: No autistic features 2: Autistic features)

anemia ANEMIA ---------- (1: No anemia 2: Anemia present)

gerd GASTROEROPHAGEAL REFLUX DISEASE ---------- (1: No GERD 2: GERD probable 3: GERD definite)

neuroreg NEUROREGRESSION ---------- (1: No Neurogression 2: Regression)

metabol METABOLIC ABNORMALITY IN BLOOD ---------- (1: No metabolic abnormality 2: Metabolic Abnormality present)

etiology POSSIBLETIMING OF CP -------- (1: Prenatal: TORCH, brain malformation, intrauterine stroke
2: perinatal: third trimesterto day one - prematurity, LBW, complicated labour, asphyxia,
3: Neonatal: after 24 hours - 28 days: jaundice, hypoglycemia, sepsis, bleed, others
4: Postnatal: After 28 days 5: Multiple insults: any combination of above
6: Timing of CP cannot be established (no history to clarify etiology)

cptreat TREATMENT FOR CP ---------- (1: None 2: Drugs 3: Orthoses 4: Surgery 5: More than one)

DEVELOPMENTAL ASSESSMENT

gmfcs GMFCS SCORE ---------- (1: Level-1, 2: Level-2, 3: Level-3, 4: Level-4, 5: Level-5)

Macs MANUAL ABILITY CLASSIFICATION SYSTEM ---------- (1: Level-1, 2: level-2, 3: Level-3, 4: Level-4, 5: Level-5)

Cfcs COMMUNICATION FUNCTION CLASSIFICATION SYSTEM -------- (1: Level-1, 2: Level-2, 3: Level-3, 4: Level-4, 5: Level-5)

VINELAND ADAPTIVE BEHAVIOUR SCALES

commss COMMUNICATION SUBSCALES ----------

dlss DAILY LIVING SUBSCALES ----------

socss SOCIAL SUBSCALES ----------

motors MOTOR SUBSCALES ----------

abc ADAPTIVE BEHAVIOUR COMPONENT ----------

DEVELOPMENTAL PAEDIATRICS UNIT

EPILEPSY DETAILS

epilepsy HISTORY OF EPILEPSY ---------- (1: No history of epilepsy 2: Epilepsy present)

ageonset AGE OF ONSET ---------- (Years. months when seizures started)

neoseizure SEIZURES IN THE NEONATAL PERIOD ---------- (1: No history of neonatal seizures 2: Neonatal seizures)

febseizure FEBRILE SEIZURE ---------- (1: No seizures 2: Febrile Seizures present)

semiolog SEMIOLOGY ---------- (1: Generalized, 2: Partial)

ifgen IF GENERALIZED ---------- (0: if not generalised 1: Tonic, 2: Clonic, 3: Myoclonic, 4: Clonic Tonic, 5: Others)

ifpartial IF PARTIAL ---------- (0: if not partial 1: Simple partial 2: Complex partial)

provk PROVOKINGFACTORS ---------- (1: None 2: Fever, 3: Tactile Stimulation, 4: Acoustic Stimulation, 5: Photic Stimulation, 6: Others)

seizfreq SEIZURE FREQUENCIES IN MONTHS ---------- (1: less than 2, 2: 2 to 4 3: 4 to 6 or weekly once 4: multiple times in a week 5: Daily)

durat AVERAGE DURATION OF SEIZURES IN MINUTES ---------- (1: Less than 1 Min, 2: 1 to 5 Min, 3: More than 5 Min)

statusepi HISTORY OF STATUS EPILEPTICUS --------- (1: No status 2: One or more episodes of Status Epilepticus)

aeds THERAPY WITH ANTIEPILEPTICS ---------- (1: Yes, 2: No)

complianc REGULAR COMPLIANCE ---------- (1: Yes, 2: No)

szcontrol SEIZURES CONTROLLED ---------- (1: Yes 2: No)

durationaeds DURATION OF ANTIEPILEPTICS --------- (1:Less than 2 months 2: 2-6 Months 3: More than 6 Months)

numaeds NUMBER OF ANTIEPILEPTICS---------- (1: One, 2: Two, 3: Three, 4: Four, 5: Five and More)

famep FAMILY HISTORY OF EPILEPSY ---------- (1: Yes, 2: No)

diurvar DIURNAL VARIATION ---------- (1: Yes-Nocturnal, 2: No-Diurnal 3: No variation)

relasleep RELATION TO SLEEP WAKE CYCLE ---------- (1: No 2: Yes 3: hypnagogic 4: hypnopompic and 5: nocturnal 6: others)

auton AUTONOMIC SYMPTOMS ---------- (1: Yes, 2: No)

ictaldrow POSTICTAL DROWSINESS ---------- (1: Yes, 2: No)

ictaldeficit POST ICTAL DEFICITS ---------- (1: Yes, 2: No)

DEVELOPMENTAL PAEDIATRICS UNIT

EEG DETAILS

eeg EEG DONE ---------- (1: EEG not done 2: EEG done)

eegabnorm EEG ABNORMALITY ---------- (1: Yes, 2: No)

interictaldis INTERICTAL DISCHARGES ---------- (1: Generalized, 2: Partial)

sleepmark SLEEP MARKERS ---------- (1: Yes, 2: No)

backgrnd BACKGROUND ---------- (1: Yes, 2: No)

durationeeg DURATION OF EEG ---------- (1: Regular EEG 2: 1-2 hour telemetry 3: More than 2 hour telemetry 4; Video EEG)

NEUROIMAGING CHARACTERISTICS

neuroimage NEUROIMAGING ---------- (1: No Neuro-imaging 2: CT only 3: MRI only 4: MRI with MRS 5:MRI and CT)

cervical UPPER CERVICAL CORD ---------- (1:No cervical cord abnormalities 2: Cervical cord abnormal 3:Not known)

calcific CALCIFICATION on MRI or CT ---------- (1: No calcification 2: Calcification 3: Not known)

perileu PERIVENTRICULAR INVOLVEMENT ---------- (1: No Periventricular involvement 2: Periventricular involvement Present 3: Not known)

deepnucl DEEP GREY NUCLEI INVOLVEMENT ---------- (1: No Deep grey nuclei 2: Involved 3: Not known)

encep ENCEPHALOMALACIA ---------- (1: No Encephalomalacia 2: Present 3: Not known)

perinatstk PERINATAL STROKE ---------- (1: No 2: Definite vascular territory stroke 3: Not known

pericor PERIROLANDIC CORTEX ---------- (1: Not involve 2: Perirolandic cortex involved 3: Not known)

ulg ULEGYRIA ---------- (1: No Ulegyria 2: Ulegyria present 3: Not known

cerebatro CEREBELLAR ATROPHY ---------- (1: Normal Cerebellum 2: Vermis and/or hemispheres abnormal 3: Not known)

malform MALFORMATIONS ---------- (1: No Brain malformation 2: Brain malformed 3: Not known)

corpthin CORPUS THINNING ---------- (1: Normal CC 2: CC thin partially or completely 3: Not known)

metchang METABOLIC CHANGES ---------- (1: No metabolic Abnormalities 2: Metabolic Abnormality 3: Not known)

enceph ENCEPHALITIS ---------- (1: No evidence of encephalitis 2: Encephalitic process 3: Not known)

inf INFECTIONS --------- (1: No evidence infectious etiology 2: Definite infective etiology 3: Not known)

hydroceph HYDROCEPHALUS ---------- (1: No evidence of hydrocephalus 2: Hydrocephalus active /arrested 3: not known)

otr OTHERS ---------- (1: None 2: Present)

MODIFIED KUPPUSAMY SCORE

(A) EDUCATION SCORE

PROFESSIONAL OR HONORS	4
GRADUATE OR POST GRADUATE	3
HIGH SCHOOL ORINTERMEDIATE OR DIPLOMA	2
ILLETERACY OR PRIMARY SCHOOL	1

(B) OCCUPATION SCORE

LEGISLATORS, SENIOR OFFICALS OR MANAGER	13
PROFESSIONALS	11
TECHNICIANS OR ASS PROFESSIONALS	9
CLERKS	7
SERVICE WORKERS SHOP OR MARKET SALERS	6
SKILLED AGRICULTURAL AND FISHERY WORKERS	5
CRAFT AND RELATED TRADES WORKERS	4
PLANT AND MACHINE OPERATORS AND ASSEMBLERS	3
UNSKILLED WORKERS	2
UNEMPLOYED	1

(C) MONTHLY FAMILY INCOME IN RUPEES

> = 32050	12
16020 - 32149	10
12020 - 16119	6
8010 - 12019	4
4810 - 8009	3
1601 - 4809	2
< =1600	1

(D) TOTAL SCORE

UPPER	26 – 29
UPPER MIDDLE	16 – 25
MIDDLE / LOWER MIDDLE	11 – 15
LOWER / UPPER LOWE	5 – 10
LOWER	< 5

Gross Motor Function Classification System for Cerebral Palsy (GMFCS)

Before 2nd Birthday

Level I Infants move in and out of sitting and floor sit with both hands free to manipulate objects. Infants crawl on hands and knees, pull to stand and take steps holding on to furniture. Infants walk between 18 months and 2 years of age without the need for any assistive mobility device.

Level II Infants maintain floor sitting but may need to use their hands for support to maintain balance. Infants creep on their stomach or crawl on hands and knees. Infants may pull to stand and take steps holding on to furniture.

Level III Infants maintain floor sitting when the low back is supported. Infants roll and creep forward on their stomachs.

Level IV Infants have head control but trunk support is required for floor sitting. Infants can roll to supine and may roll to prone.

Level V Physical impairments limit voluntary control of movement. Infants are unable to maintain antigravity head and trunk postures in prone and sitting. Infants require adult assistance to roll.

Between 2nd and 4th Birthday

Level I Children floor sit with both hands free to manipulate objects. Movements in and out of floor sitting and standing are performed without adult assistance. Children walk as the preferred method of mobility without the need for any assistive mobility device.

Level II Children floor sit but may have difficulty with balance when both hands are free to manipulate objects. Movements in and out of sitting are performed without adult assistance. Children pull to stand on a stable surface. Children crawl on hands and knees with a reciprocal pattern, cruise holding onto furniture and walk using an assistive mobility device as preferred methods of mobility.

Level III Children maintain floor sitting often by "W-sitting" (sitting between flexed and internally rotated hips and knees) and may require adult assistance to assume sitting. Children creep on their stomach or crawl on hands and knees (often without reciprocal leg movements) as their primary methods of self mobility. Children may pull to stand on a stable surface and cruise short distances. Children may walk short distances indoors using an assistive mobility device and adult assistance for steering and turning.

Level IV Children floor sit when placed, but are unable to maintain alignment and balance without use of their hands for support. Children frequently require adaptive equipment for sitting and standing. Self mobility for short distances (within a room) is achieved through

rolling, creeping on stomach, or crawling on hands and knees without reciprocal leg movement.

Level V Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology.

Between 4th and 6th Birthday

Level I Children get into and out of, and sit in, a chair without the need for hand support. Children move from the floor and from chair sitting to standing without the need for objects for support. Children walk indoors and outdoors, and climb stairs. Emerging ability to run and jump.

Level II Children sit in a chair with both hands free to manipulate objects. Children move from the floor to standing and from chair sitting to standing but often require a stable surface to push or pull up on with their arms. Children walk without the need for any assistive mobility device indoors and for short distances on level surfaces outdoors. Children climb stairs holding onto a railing but are unable to run or jump.

Level III Children sit on a regular chair but may require pelvic or trunk support to maximize hand function. Children move in and out of chair sitting using a stable surface to push on or pull up with their arms. Children walk with an assistive mobility device on level surfaces and climb stairs with assistance from an adult. Children frequently are transported when travelling for long distances or outdoors on uneven terrain.

Level IV Children sit on a chair but need adaptive seating for trunk control and to maximize hand function. Children move in and out of chair sitting with assistance from an adult or a stable surface to push or pull up on with their arms. Children may at best walk short distances with a walker and adult supervision but have difficulty turning and maintaining balance on uneven surfaces. Children are transported in the community. Children may achieve self-mobility using a power wheelchair.

Level V Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent mobility and are transported. Some children achieve self-mobility using a power wheelchair with extensive adaptations.

Between 6th and 12th Birthday

Level I Children walk indoors and outdoors, and climb stairs without limitations. Children perform gross motor skills including running and jumping but speed, balance, and coordination are reduced.

Level II Children walk indoors and outdoors, and climb stairs holding onto a railing but experience limitations walking on uneven surfaces and inclines, and walking in crowds or confined spaces. Children have at best only minimal ability to perform gross motor skills such as running and jumping.

Level III Children walk indoors or outdoors on a level surface with an assistive mobility device. Children may climb stairs holding onto a railing. Depending on upper limb function, children propel a wheelchair manually or are transported when travelling for long distances or outdoors on uneven terrain.

Level IV Children may maintain levels of function achieved before age 6 or rely more on wheeled mobility at home, school, and in the community. Children may achieve self-mobility using a power wheelchair.

Level V Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Children have no means of independent mobility and are transported.

MACS (MANUAL ABILITY CLASSIFICATION SYSTEM)

1. **Handles objects easily and successfully -** At most, limitations in the ease of performing manual tasks requiring speed and accuracy. However, any limitations in manual abilities do not restrict independence in daily activities.
2. **Handles most objects but with some what reduced quality and/or speed of achievement** - Certain activities may be avoided or be achieved with some difficulty; alternative ways of performance might be used but manual abilities do not usually restrict independence in daily activities.
3. **Handles objects with difficulty needs help to prepare and/or modify activities -** The performance is slow and achieved with limited success regarding quality and quantity. Activities are performed independently if they have been set up or adapted.
4. **Handles a limited selection of easily managed objects in adapted situations -** Performs parts of activities with effort and with limited success. Requires continuous support and assistance and/or adapted equipment, for even partial achievement of the activity.
5. **Does not handle objects and has severely limited ability to perform even simple actions** Requires total assistance.

CFCS (COMMUNICATION FUNCTION CLASSIFICATION SYSTEM)

1. **Effective Sender and Receiver with unfamiliar and familiar partners -** The person independently alternates between sender and receiver roles with most people in most environments. The communication occurs easily and at a comfortable pace with both unfamiliar and familiar conversational partners. Communication misunderstandings are quickly repaired and do not interfere with overall effectiveness of the person's communication.
2. **Effective but slower paced Sender and/or Receiver with unfamiliar and/or familiar partners - The** person independently alternates between sender and receiver roles with most people in most environments, but the conversational pace is slow and may make the communication interaction more difficult. The person may need extra time to understand message, compose messages and/or repair misunderstandings. Communication misunderstanding are often repaired and do not interfere with the eventual effectiveness of the person's communication with both unfamiliar and familiar partners.
3. **Effective Sender and Receiver with familiar partners** - The person alternates between sender and receiver roles with familiar (but not unfamiliar) conversational partners in most environments. Communication is not consistently effective with most unfamiliar partners, but is usually effective with familiar partners.
4. **Inconsistent Sender and/or Receiver with familiar partners** - The person does not consistently alternate sender and receiver roles. This type of inconsistency might be seen in differently types of communicators including
    (a) An occasionally effective sender and receiver
    (b) An effective sender but limited receiver
    (c) A limited sender but effective receiver.
    (d) Communication is sometimes effective with familiar partners.

DEVELOPMENTAL PAEDIATRICS UNIT

Name: _____

Birth date: _____

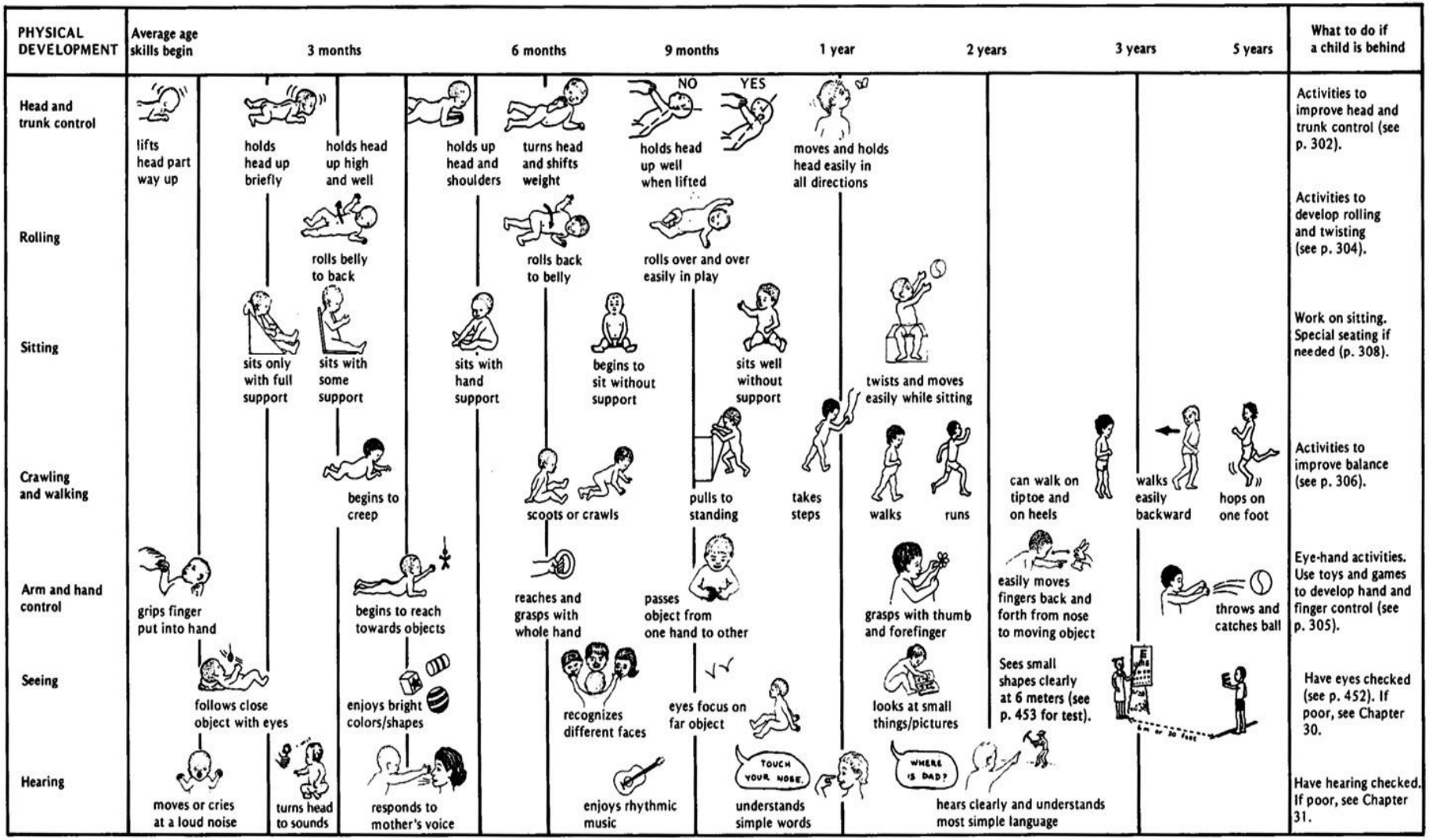
Date: _____

RECORD SHEET 6 (page 1)

EVALUATION OF A CHILD'S LEVEL OF *PHYSICAL* DEVELOPMENT

Note: Although on these guides physical and mental skills are separated, the two are often closely interrelated.

These charts show roughly the average age that a normal child develops different skills. But there is great variation within what is normal.



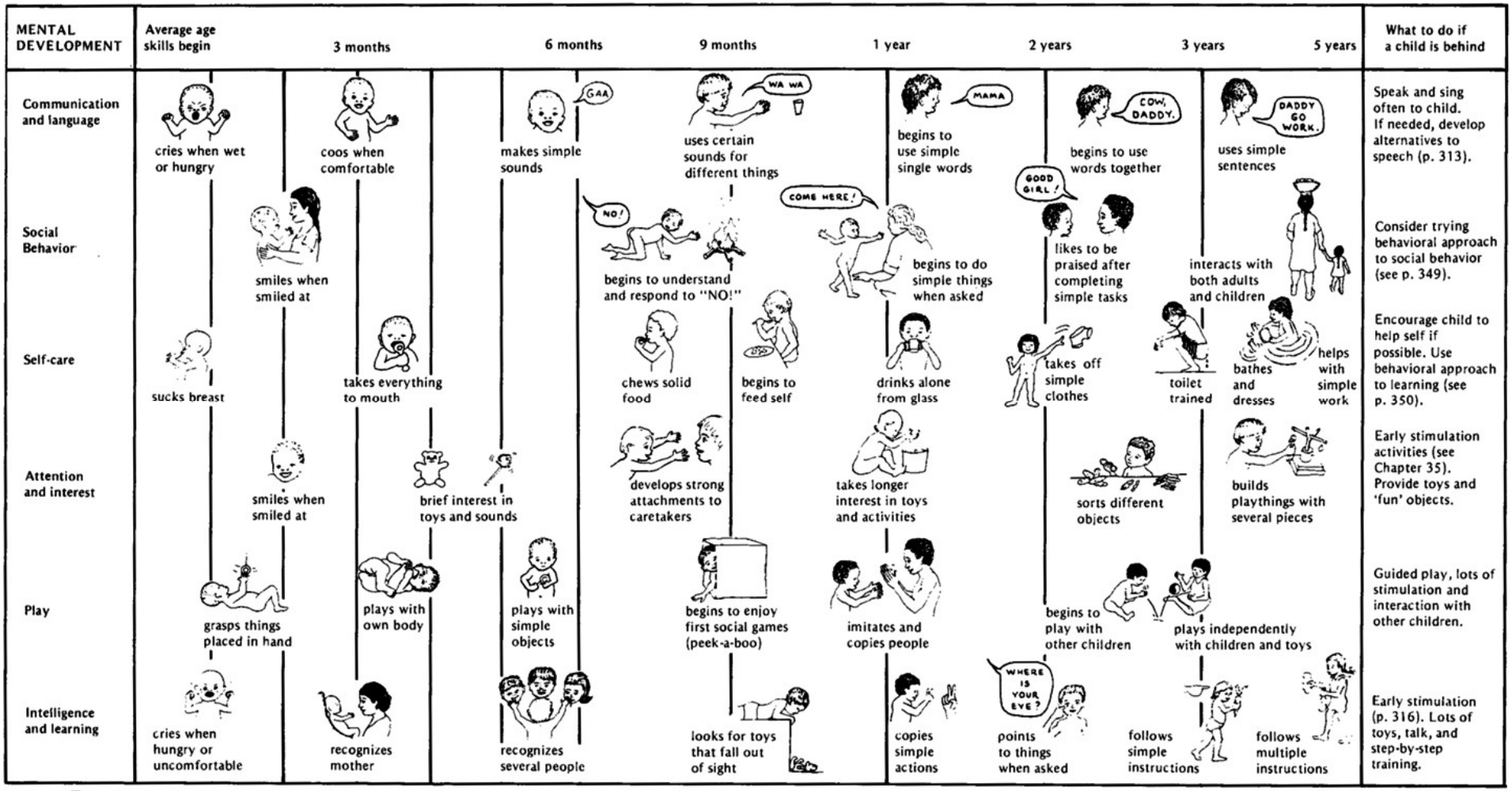
DEVELOPMENTAL PAEDIATRICS UNIT

Name: _____

Birth date: _____

Date: _____

EVALUATION OF A CHILD'S LEVEL OF *MENTAL AND SOCIAL* DEVELOPMENT



Put a (circle) around the level of development that the child is now at in each area.

Put a [square] around the skill to the right of the one you circled, and focus training on that skill.

If the child has reached an age and has not mastered the corresponding level of skill, special training may be needed.

RECORD SHEET 6 (page 2)

PEDICON 2017
54th Annual Conference of Indian Academy of Pediatrics
Date : 18th to 22nd January 2017, Venue : Gayathri Vihar, Palace Grounds, Bengaluru

POSTER TITLE:
EPILEPSY IN CEREBRAL PALSY: PREVALENCE AND RISK FACTORS

PRESENTER NAME:
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CO-AUTHORS:
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INTRODUCTION AND KEYWORDS:
Epilepsy is a common complication of cerebral palsy (CP) and occurs in about 15-60% of children with CP.[1]
(Key words – epilepsy, cerebral palsy)

AIM:
To determine the prevalence and the risk factors associated with presence of epilepsy in children with CP.

MATERIALS AND METHODS:
246 consecutive children (174 boys and 72 girls) with CP aged between 1-15 years (mean age 14.1 months) were recruited prospectively.
Epilepsy was defined as occurrence of two unprovoked seizures 24 hours apart.
Risk factors which were studied included, history of neonatal seizures, socioeconomic status (assessed by modified Kuppusamy score), motor function (assessed by Gross Motor Function score - GMFCS), nutritional status (assessed by the weight for age Z score of WHO Multi-centre growth reference study (MGRS), head circumference (HC) (Z score of head based on WHO MGRS) and Social adaptive quotient obtained on the Vineland Adaptive behaviour scales.

RESULTS:
Of the total cohort of 246 children, 74 children (30.1%) had epilepsy.
Of the 74 children, 8.1% had focal seizures and 37% had myoclonic seizures, and the remaining 54.9% had generalised seizures.
Of the 246 children 76% had spastic CP, 18.3% had mixed CP and 3.3% had extra-pyramidal form of CP
77% had GMFCS level between 3 -5 (Non-ambulant); 70% were malnourished (Wt. of age of <-2SD)
31% had history of neonatal seizures; The median age of onset of epilepsy was 7 months.

Table 1 shows the relationship between Epilepsy and the various risk factors

Risk factor	Univariate analysis		Multivariate analysis	
	p-value	Unadjusted OR (95% CI)	p-value	Adjusted OR (95%CI)
History of neonatal seizures	**<0.001**	3.26 (1.76-5.56)	**0.008**	2.326 (1.251-4.323)
Microcephaly	**<0.001**	5.82 (2.22-15.3)	**0.004**	4.387 (1.609-11.966)
Social quotient of <70%	**<0.001**	5.58 (2.12-14.7)	**0.041**	2.934 (1.047-8.221)
GMFCS level 3-5	**0.003**	3.19 (1.43-7.15)	**0.06**	2.398 (0.965-5.961)
Gender	0.88	0.94 (0.52-1.72)	Not entered into the Multivariate model	
Low Socio-economic status	0.23	1.41 (0.8-2.5)		
Malnutrition (Wt. for age<-2SD)	0.54	0.83 (0.46-1.49)		

DISCUSSION:
In this study we found that *history of seizures in the neonatal period*, *microcephaly, inability to ambulate independently and a lower social adaptive quotient* were all independently associated with epilepsy in CP. The results in this study are comparable to other studies. In Kwong's study[2] the prevalence of epilepsy in CP was 37.6% and in Singhi's study[3] it was 34.5%. Bruck et al[4] found that neonatal seizure was significantly associated with epilepsy. In most studies epilepsy was more common among those with significant motor involvement (in those who were tetraplegic) and those with intellectual disability.[5]

CONCLUSION:
Epilepsy is a common complication of CP and should be anticipated when there is history of neonatal seizures, microcephaly, poor social quotient or significant motor disability. Early identification and treatment may help in better control of seizures and improving the quality of life in CP children.

REFERENCES:
1. Wallace, S. J. Epilepsy in cerebral palsy. Dev. Med. Child Neurol. 43, 713–717 (2001
2. Kwong, K. L., Wong, S. N. & So, K. T. Epilepsy in children with cerebral palsy. Pediatr. Neurol. 19, 31–36 (1998)
3. Singhi, P., Jagirdar, S., Khandelwal, N. & Malhi, P. Epilepsy in children with cerebral palsy. J. Child Neurol. 18, 174–179 (2003).
4. Bruck I, Antoniuk S. A, Spessatto A et al. Epilepsy in children with cerebral palsy. Arq Neuropsiquiatr 2001;59(1):35-39
5. Gururaj, A. K., Sztriha, L., Bener, A., Dawodu, A. & Eapen, V. Epilepsy in children with cerebral palsy. Seizure 12, 110–114 (2003).
6.

Data Sheet

IDNO	EEG	EPILEPS	NEON_S	FAM_HI	MRICS	NEUROI	MURUG	ETIOL_DE	ETIOLO	DOB	AGE_AN	AGEONS	SEMIOL	TOPOGR	TOPOGR	SZCONT	GEN_OR	IFGENIF	PARTIA	BIRTHWT	GA_ANA	GE
1	0.00	1	1	2		2	26.00		3	02-Oct-2010	65	0	0	4.00	4.00	0	0	0	0	2,500	40.0	
2	3.00	1	2	2	32.00	3	23.00	23.00	2	26-Mar-2012	48	0	0	7.00	6.00	0	0	0	0	3,250	40.0	
3	0.00	1	1	2		2	23.00		2	15-Dec-2010	63	0	0	2.00	2.00	0	0	0	0	3,500	40.0	
4	0.00	1	1	2		1	22.00		2	27-Jul-2011	56	0	0	2.00	2.00	0	0	0	0	1,800	40.0	
5	3.00	2	1	1	11.00	3	13.00	13.00	1	28-Sep-2003	149	14	4	3.00	3.00	2	1	4	0	2,800	40.0	
6	1.00	2	1	2	40.00	3	41.00	41.00	4	05-Feb-2014	24	2	4	1.00	1.00	1	1	4	0	2,880	37.0	
7	0.00	1	1	2	31.00	3	28.00	28.00	2	08-Sep-2014	17	0	0	3.00	3.00	0	0	0	0	3,160	40.0	
8	1.00	2	2	1	11.00	5	11.00	11.00	1	06-Jan-2012	50	5	3	3.00	3.00	1	1	3	0	2,750	39.0	
9	0.00	1	1	2	50.00	3	23.00	23.00	2	07-Dec-2013	27	0	0	3.00	3.00	0	0	0	0	4,000	40.0	
10	0.00	1	1	2		2	22.00		1	07-Feb-2011	62	0	0	2.00	2.00	0	0	0	0	1,700	36.0	
11	1.00	2	2	1	21.00	3	23.00	23.00	5	19-Feb-2015	13	1	5	3.00	3.00	1	1	5	0	3,000	40.0	
12	3.00	2	2	2		2	23.00		2	04-Sep-2012	42	3	3	3.00	3.00	2	1	3	0	3,500	40.0	
13	0.00	1	1	2	31.00	3	26.00	26.00	3	27-Mar-2007	108	0	0	3.00	3.00	0	0	0	0	2,500	40.0	
14	1.00	1	1	2	2,131.00	5	60.00	60.00	1	20-Jun-2012	45	0	0	1.00	1.00	0	0	0	0	3,000	40.0	
15	2.00	1	1	2		1	21.00	21.00	2	28-Jan-2011	62	0	0	2.00	2.00	0	0	0	0	880	26.0	
16	0.00	1	1	2		2	21.00		2	03-Oct-2010	66	0	0	2.00	2.00	0	0	0	0	1,300	32.0	
17	0.00	1	1	2		2	23.00		2	18-May-2014	22	0	0	3.00	3.00	0	0	0	0	2,500	40.0	
18	0.00	1	1	2		2	21.00		2	12-Nov-2013	29	0	0	2.00	2.00	0	0	0	0	1,900	30.0	
19	2.00	2	1	1		2	22.00		2	14-Mar-2014	25	2	3	3.00	3.00	1	1	3	0	1,900	37.0	
20	3.00	2	2	2		2	23.00		2	12-Dec-2012	40	1	5	3.00	3.00	2	1	5	0	2,600	32.0	
22	0.00	1	1	2	21.00	3	22.00	22.00	2	12-May-2014	23	0	0	2.00	2.00	0	0	0	0	1,750	37.0	
23	2.00	2	2	2		2	23.00		2	28-Dec-2014	15	9	3	3.00	3.00	1	1	3	0	3,700	40.0	
24	0.00	1	1	2	40.00	3	60.00	60.00	6	08-Jan-2014	28	0	0	2.00	2.00	0	0	0	0	2,500	40.0	
25	1.00	1	1	2	40.00	3	60.00	60.00	2	29-May-2015	24	0	0	2.00	2.00	0	0	0	0			
26	3.00	1	2	2	21.00	3	23.00	23.00	2	28-Sep-2011	55	0	0	7.00	6.00	0	0	0	0	2,500	40.0	
27	2.00	2	1	1	21.00	3	21.00	21.00	2	08-Jun-2014	22	7	3	7.00	6.00	1	1	3	0	1,200	32.0	
28	1.00	2	2	1	31.00	3	23.00	2,324.00	2	20-May-2014	23	20	1	7.00	6.00	1	1	1	0	2,475	40.0	
29	0.00	1	2	2	31.00	3	23.00	23.00	2	16-Jun-2010	63	0	0	7.00	6.00	0	0	0	0	3,900	40.0	
30	2.00	2	1	2	32.00	3	23.00	23.00	2	01-Nov-2007	102	72	4	1.00	1.00	1	1	4	0	2,500	40.0	
31	1.00	2	1	1	31.00	3	23.00	23.00	1	02-Dec-2006	112	24	4	7.00	6.00	1	1	4	0		40.0	
33	1.00	2	1	2	31.00	4	26.00	26.00	2	04-Nov-2012	41	9	3	5.00	4.00	1	1	3	0	2,400	40.0	
34	0.00	1	1	2		2	21.00		2	20-Sep-2012	43	0	0	2.00	2.00	0	0	0	0	2,750	34.0	
35	0.00	1	1	2	21.00	5	21.00	21.00	2	03-Oct-2012	42	0	0	2.00	2.00	0	0	0	0	1,000	28.0	
36	0.00	1	1	2	31.00	5	26.00	26.00	3	21-Mar-2014	25	0	0	7.00	6.00	0	0	0	0	2,778	40.0	
37	0.00	1	1	2	31.00	4	26.00	26.00	3	11-Dec-2012	40	0	0	5.00	4.00	0	0	0	0	2,250	40.0	
38	0.00	1	1	2	21.00	5	21.00	21.00	2	28-Mar-2001	180	0	0	3.00	3.00	0	0	0	0	700	28.0	
39	3.00	2	2	2		2	23.00		2	25-Apr-2013	37	1	1	3.00	3.00	2	1	1	0	1,940	35.0	
40	2.00	2	2	2	21.00	3	23.00	23.00	2	16-Feb-2009	86	72	4	3.00	3.00	1	1	4	0	2,500	37.3	
41	0.00	1	1	2	21.00	3	23.00	23.00	6	02-Sep-2007	104	0	0	1.00	1.00	0	0	0	0	2,400	40.0	
43	0.00	1	1	2	21.00	3	21.00	21.00	2	10-Mar-2013	38	0	0	2.00	2.00	0	0	0	0	1,820	33.4	
44	0.00	2	1	1		2	21.00		2	01-Oct-2003	151	7	4	1.00	1.00	1	1	4	0	1,800	35.0	
45	2.00	2	1	1	33.00	3	28.00	28.00	1	17-Mar-2012	49	7	3	1.00	1.00	1	1	3	0	2,675	40.0	
46	1.00	2	1	2	21.00	3	22.00	22.00	2	25-Jul-2011	57	57	4	3.00	3.00	2	1	4	0	1,700	40.0	
47	0.00	1	1	2	21.00	3	21.00	21.00	2	30-Mar-2011	62	0	0	1.00	1.00	0	0	0	0	1,400	32.0	
48	2.00	2	1	1	32.00	3	22.00	22.00	2	08-Jan-2011	64	18	1	3.00	3.00	1	1	1	0	1,800	36.6	
49	0.00	1	1	2	2,140.00	3	21.00	21.00	2	18-May-2014	24	0	0	2.00	2.00	0	0	0	0	1,360	32.0	
50	0.00	1	1	2		2	28.00	28.00	1	18-Apr-2014	25	0	0	1.00	1.00	0	0	0	0	3,250	40.0	
51	2.00	2	1	1		2	27.00		2	21-Jul-2008	90	7	4	3.00	3.00	1	1	4	0	2,350	40.0	
52	0.00	1	2	2	32.00	3	23.00	23.00	2	24-May-2011	59	0	0	1.00	1.00	0	0	0	0	2,200	40.0	
53	2.00	2	1	1	31.00	4	42.00	42.00	4	31-Aug-2011	57	36	3	3.00	3.00	1	1	3	0	5,000	40.0	
54	2.00	2	2	2	21.00	3	23.00	2,327.00	2	09-Jun-2013	35	18	4	1.00	1.00	1	1	4	0	2,000	40.0	
55	0.00	1	1	2		2	21.00		2	17-Jul-2011	58	0	0	2.00	2.00	0	0	0	0	750	28.0	
56	0.00	1	1	2		2	21.00		2	17-Jan-2013	40	0	0	3.00	3.00	0	0	0	0	1,100	28.0	
57	0.00	1	1	2	21.00	3	21.00	21.00	2	29-Dec-2013	28	0	0	3.00	3.00	0	0	0	0	850	27.0	
58	2.00	1	1	2	32.00	3	23.00	23.00	2	09-Nov-2003	150	0	0	1.00	1.00	0	0	0	0	2,500	38.0	
59	2.00	2	1	1	21.00	3	23.00	23.00	2	22-Mar-2013	39	2	3	7.00	6.00	2	1	3	0	3,700	40.0	
60	0.00	1	2	2	21.00	3	21.00	21.00	2	11-Apr-2013	37	0	0	3.00	3.00	0	0	0	0	1,975	33.4	
61	2.00	1	2	2		2	23.00		2	28-Feb-2010	75	0	0	1.00	1.00	0	0	0	0	2,500	32.0	
62	1.00	2	2	2	21.00	3	23.00	23.00	2	02-Oct-2014	19	5	1	7.00	6.00	2	1	1	0	3,000	40.0	
63	1.00	2	1	2	31.00	3	23.00	23.00	2	12-Jan-2014	144	96	1	3.00	3.00	1	1	1	0	3,200	39.0	
64	2.00	1	1	2	32.00	3	23.00	23.00	2	04-Mar-2011	61	0	0	3.00	3.00	0	0	0	0	2,500	40.0	
65	1.00	1	1	2	31.00	3	26.00	26.00	3	13-Mar-2014	26	0	0	7.00	6.00	0	0	0	0	2,650	40.0	
66	2.00	2	1	2	21.00	3	21.00	21.00	2	22-Oct-2010	68	36	7	3.00	3.00	1	2	0	1	1,630	31.0	
67	0.00	1	1	2		2	23.00		2	20-May-2005	131	0	0	3.00	3.00	0	0	0	0	2,700	40.0	
68	0.00	1	1	2		2	23.00		2	07-May-2007	108	0	0	7.00	6.00	0	0	0	0	2,115	35.0	
69	0.00	1	1	2	21.00	3	28.00	28.00	2	08-Feb-2011	64	0	0	2.00	2.00	0	0	0	0	2,400	40.0	
70	2.00	2	1	2	32.00	3	23.00	23.00	4	26-May-2011	60	6	3	3.00	3.00	1	1	3	0	2,750	40.0	
72	1.00	1	1	2	31.00	3	26.00	26.00	3	31-May-2014	24	0	0	3.00	3.00	0	0	0	0	1,500	32.0	
73	0.00	1	1	2		2	23.00		2	11-Mar-2011	62	0	0	2.00	2.00	0	0	0	0	2,600	32.0	
74	1.00	1	1	2	21.00	3	23.00	2,321.00	2	17-Jan-2012	53	0	0	3.00	3.00	0	0	0	0	1,850	32.0	
75	4.00	1	1	2	21.00	3	23.00	23.00	2	13-Dec-2014	18	0	0	3.00	3.00	0	0	0	0	3,090	40.0	
76	1.00	1	1	2	11.00	3	13.00	13.00	1	27-Oct-2011	55	0	0	3.00	3.00	0	0	0	0		40.0	
77	3.00	1	1	2	31.00	3	23.00	23.00	2	07-Nov-2014	19	0	0	7.00	6.00	0	0	0	0	3,000	40.0	
78	0.00	1	1	2	21.00	6	23.00	23.00	2	16-May-2012	48	0	0	3.00	3.00	0	0	0	0	3,300	40.0	
79	1.00	1	1	2	31.00	3	23.00	23.00	2	26-Sep-2011	58	0	0	3.00	3.00	0	0	0	0	3,500	39.1	
80	0.00	1	1	2	40.00	3	25.00	25.00	2	08-Dec-2012	42	0	0	3.00	3.00	0	0	0	0	2,200	40.0	
81	0.00	1	2	2		1	21.00		2	14-May-2009	85	0	0	3.00	3.00	0	0	0	0	1,000	28.0	
82	1.00	1	1	2	12.00	6	14.00	14.00	1	25-Dec-2013	30	0	0	3.00	3.00	0	0	0	0	3,000	40.0	
83	0.00	2	2	1		1	21.00		2	20-Nov-2005	126	8	4	2.00	2.00	1	1	4	0	1,750	28.0	
84	1.00	1	1	2		2	21.00		2	30-Apr-2013	37	0	0	3.00	3.00	0	0	0	0	1,900	28.0	
85	0.00	2	1	1		2	23.00		1	01-Jul-2014	23	5	4	7.00	6.00	1	1	4	0	2,500	40.0	
86	0.00	1	1	2	21.00	3	60.00	60.00	2	27-Jun-2014	24	0	0	2.00	2.00	0	0	0	0	2,460	38.0	
87	3.00	2	1	1		2	27.00		3	31-Aug-2009	81	6	4	3.00	3.00	1	1	4	0	2,150	40.0	
88	0.00	1	1	2		1	22.00		2	09-Sep-2009	81	0	0	3.00	3.00	0	0	0	0	2,000	39.0	
89	0.00	1	2	2		2	23.00		2	17-Jun-2014	24	0	0	7.00	6.00	0	0	0	0	2,750	38.0	
90	1.00	1	2	2		2	23.00		2	05-Mar-2000	195	0	0	3.00	3.00	0	0	0	0	3,500	40.0	
91	1.00	1	1	2		2	21.00		2	13-May-2005	133	0	0	3.00	3.00	0	0	0	0	1,600	28.0	
92	0.00	1	2	2		2	23.00		2	06-Jun-2007	108	0	0	3.00	3.00	0	0	0	0	2,600	40.0	
93	0.00	1	1	2	21.00	3	21.00	21.00	2	23-Sep-2012	45	0	0	3.00	3.00	0	0	0	0	1,500	28.0	
94	0.00	1	1	2		1	23.00		2	29-Jan-2010	80	0	0	2.00	2.00	0	0	0	0	1,700	36.0	
95	1.00	1	2	2	21.00	3	23.00	23.00	2	14-Oct-2011	56	0	0	3.00	3.00	0	0	0	0	2,500	40.0	
96	0.00	1	1	2		1	60.00		2	26-Jun-2006	120	0	0	2.00	2.00	0	0	0	0	4,500	40.0	
97	2.00	2	2	2	31.00	3	23.00	23.00	2	18-Aug-2010	70	18	4	7.00	6.00	1	1	4	0	2,700	40.0	
98	0.00	1	1	2	21.00	3	21.00	21.00	2	18-Jun-2015	12	0	0	7.00	6.00	0	0	0	0	2,500	32.0	
99	1.00	2	2	1	32.20	2	23.00	23.00	2	05-Aug-2013	34	34	1	7.00	6.00	1	1	1	0	2,530	40.0	
100	1.00	1	1	2		2	23.00		2	15-Jul-2014	23	0	0	3.00	3.00	0	0	0	0	2,750	39.0	
101	0.00	1	1	2		1	21.00		2	08-Sep-2012	46	0	0	3.00	3.00	0	0	0	0	1,300	32.0	
102	1.00	1	1	2	31.00	3	26.00	26.00	2	21-Oct-2012	44	0	0	3.00	3.00	0	0	0	0	2,300	38.0	
103	1.00	1	2	2	31.00	3	26.00	26.00	3	15-Aug-2014	22	0	0	3.00	3.00	0	0	0	0	2,750	40.0	

MOME	PATEI	KUPP_	YOM	CONS/	LIVIN(	NEODI	ABOR	SIBLIN	MOMR	FAMIL	ANTEN	FLUID	LABOF	MECO	DELIV	MOMC	POB_A	INOUT	TWIN_	BIRTHHC	BIRTHLE	STRUC	BIRTH	APGAR	COLOF	NEOFI	DBF	NEC
3	7	2	2	2	4	1	1	1	2	1	1	1	1	1	2	1	1	2	1	33.9	45.9	1	1	99	3	1	1	
5	4	2	1	2	2	1	1	1	1	2	1	1	1	1	1	1	2	2	1	35.0	47.0	1	4	99	1	1	5	
7	7	5	1	2	3	1	3	1	2	2	1	1	1	1	2	1	2	2	1	36.9	50.9	1	1	99	1	1	4	
7	7	5	1	2	2	1	1	1	2	1	1	2	1	1	2	1	1	2	1	33.9	35.9	1	2	99	3	2	4	
4	3	1	2	2	2	1	2	1	1	1	1	1	2	1	2	1	1	2	1	33.9	35.9	1	9	99	1	1	4	
6	6	4	1	2	2	1	1	1	1	1	1	1	2	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	2	
6	7	4	1	2	2	1	1	1	2	1	1	1	1	1	2	1	1	2	1	33.9	45.9	1	1	99	1	1	5	
6	6	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	33.9	45.9	1	4	99	1	2	1	
3	4	2	1	2	4	3	3	1	1	1	1	1	1	1	1	1	2	2	1	36.9	50.9	1	2	99	1	1	4	
6	7	2	1	2	2	1	2	1	1	1	1	1	2	1	1	1	2	2	1	30.9	35.9	1	1	99	1	1	1	
4	5	3	1	2	2	1	1	1	1	1	1	1	2	1	1	2	1	2	1	33.9	45.0	1	4	99	1	2	4	
4	5	3	1	1	2	1	2	1	1	1	1	1	2	1	2	1	1	2	1	33.9	45.9	1	4	99	1	1	4	
5	5	3	2	2	3	1	1	1	1	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	1	
6	5	3	1	2	3	1	1	1	1	2	1	1	1	1	1	1	1	2	1	33.9	50.9	1	1	99	1	1	1	
7	6	4	1	2	4	1	1	1	1	1	1	1	2	1	2	1	1	2	2	30.9	35.9	1	4	99	1	2	4	
4	4	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	30.9	35.9	1	1	99	1	1	1	
3	3	5	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	33.9	45.9	1	1	99	1	1	1	
6	6	4	1	2	2	1	1	1	1	1	1	2	1	1	2	2	2	2	1	30.9	35.9	1	1	99	1	1	4	
6	5	3	1	2	3	1	1	1	2	1	2	1	2	1	1	1	2	2	1	30.9	35.9	1	4	99	1	1	5	
6	6	4	1	2	2	1	2	1	1	1	1	1	1	1	2	1	2	2	1	30.9	35.9	1	2	99	1	1	4	
5	5	3	1	2	2	1	1	1	1	2	2	2	1	1	2	1	2	2	1	30.9	35.9	1	1	99	1	1	4	
3	5	4	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	30.9	50.9	1	4	99	1	2	5	
3	3	2	1	1	2	2	3	2	1	1	1	1	1	1	2	1	1	2	1	33.9	45.9	1	1	99	1	1	4	
7	7	5	1	2	2	1	2	1	9	9	9	9	9	9	9	9	9	2	1	30.9	35.9	9	9	99	9	9	9	
5	6	4	1	2	2	1	1	1	2	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	3	99	1	1	4	
7	7	3	1	2	2	2	2	2	2	1	1	2	1	1	2	2	2	2	2	30.9	35.9	1	1	99	1	1	4	
5	7	3	2	2	3	1	1	1	1	1	1	2	1	1	2	2	2	2	1	33.9	45.9	1	3	99	1	1	5	
3	6	3	1	2	2	1	1	1	1	1	1	1	1	1	1	1	4	2	1	36.9	50.9	1	4	99	2	1	4	
6	5	4	1	2	3	1	1	1	1	1	1	2	1	1	1	1	2	2	1	33.9	45.9	1	4	99	1	1	4	
5	4	1	2	2	4	1	2	1	1	1	1	1	2	1	1	1	1	2	1	33.9	45.9	1	3	99	1	1	5	
7	6	5	1	2	2	1	1	1	2	1	1	1	1	1	2	2	2	2	1	33.9	45.9	1	1	99	1	1	1	
7	4	4	2	2	4	1	3	1	2	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	1	
3	3	2	2	2	3	1	2	1	1	1	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	99	1	1	1	
4	4	2	1	2	2	1	1	1	1	1	1	1	2	1	2	1	2	2	1	33.9	45.9	1	1	99	3	1	2	
5	5	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	33.9	45.9	1	1	99	3	1	1	
6	6	5	2	1	2	1	2	1	2	1	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	1	1	1	5	
7	5	3	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	30.5	35.9	1	4	99	1	2	4	
5	6	5	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	4	
3	3	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	4	2	1	33.9	45.9	1	1	99	1	1	5	
7	7	5	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	1	1	1	1	
7	7	3	2	2	2	1	1	1	1	1	1	2	1	1	2	1	2	2	1	33.9	35.9	1	4	99	1	1	5	
7	7	4	1	2	3	1	2	1	1	2	1	1	1	1	1	1	1	2	1	33.9	45.9	1	1	99	1	1	1	
7	6	4	1	1	3	1	1	1	1	1	1	1	1	1	2	1	2	2	1	30.9	35.9	1	4	99	1	1	4	
5	5	3	1	1	2	1	1	1	1	1	1	1	2	1	1	1	2	2	2	30.9	35.9	1	1	99	1	1	4	
5	7	4	1	2	2	1	2	1	2	1	1	1	1	1	2	1	2	2	2	33.9	45.9	1	1	99	1	1	4	
6	5	3	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	99	1	1	4	
6	7	5	2	2	3	1	2	1	2	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	1	
5	3	4	2	1	2	2	1	1	1	1	2	1	1	1	2	1	2	2	1	33.9	45.9	2	4	99	2	1	1	
4	5	2	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	33.9	45.9	1	4	99	1	1	4	
1	4	3	2	2	3	3	1	1	1	1	1	1	1	1	2	1	2	2	1	36.9	50.9	1	1	99	1	1	2	
5	5	4	1	2	2	1	1	1	1	1	1	1	1	1	1	1	4	2	1	33.9	45.9	1	4	99	3	1	4	
3	3	3	1	2	3	1	1	1	1	1	1	1	1	1	1	1	4	2	1	30.9	35.9	1	1	99	1	1	5	
6	6	4	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	30.9	35.9	1	1	99	1	1	4	
6	5	4	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	99	1	1	4	
5	6	3	2	1	1	1	1	1	1	1	1	1	2	1	4	1	2	2	1	33.9	45.9	1	4	99	1	1	4	
4	5	2	1	2	3	1	4	1	1	1	1	1	1	1	2	1	2	2	1	36.9	50.9	1	4	99	1	1	4	
6	6	3	1	1	2	1	1	1	1	2	1	1	1	1	1	1	2	2	1	30.9	35.9	1	1	99	1	1	4	
5	7	3	2	2	2	1	1	1	1	1	1	3	1	1	1	1	4	2	1	33.9	45.9	1	4	99	1	1	4	
4	4	2	1	2	3	1	2	1	1	1	1	1	1	1	1	1	1	2	1	33.9	45.9	1	4	99	1	1	5	
4	6	4	2	2	4	1	1	1	1	1	1	1	1	1	1	1	2	2	1	33.9	45.9	1	4	99	1	1	4	
7	7	4	1	2	2	1	1	1	1	1	1	2	1	1	2	1	2	2	1	33.9	45.9	1	2	99	1	1	4	
6	6	3	1	2	2	2	1	2	1	1	1	1	1	1	2	1	2	2	1	33.9	45.9	1	1	99	1	1	4	
7	7	4	1	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	1	30.9	35.9	1	1	99	1	1	4	
3	4	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	4	2	1	33.9	45.9	1	4	99	1	1	4	
7	5	4	2	2	4	1	3	1	2	1	1	2	1	1	2	1	2	2	2	30.9	35.9	1	4	1	1	1	4	
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TIMER	NICU_	ASPHY	RESUS	HIEHIE	OXYGI	RESPR	VENTV	DURVEN	SHOCK	SEPSIS	ARFAC	POLYN	ANEM	PLATL	HYPOC	HYPOC	HYPER	CHOLI	LMAL_	OSTOP	PDAPA	NECNE	HEART	GECGI	IVHINT	ROPRE	PVLPE	NEOCC
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5	5	1	2	0	2	2	2	48.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	1
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2	8	2	2	9	3	2	2	72.00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	7	2	1	9	1	1	1	0.00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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1	30	1	2	1	3	2	2	84.00	9	9	9	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
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1	0	1	1	0	1	1	1	0.00	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
2	7	2	2	2	3	2	2	48.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	1
2	20	2	2	1	3	2	1	0.00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	13	2	1	9	1	1	1	0.00	9	9	9	9	9	9	9	9	2	9	9	9	9	9	9	9	9	9	9	9
1	5	1	1	0	3	1	1	0.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	1
1	0	1	1	0	1	1	1	0.00	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

WALK	SPEAK	SPAST	FLOPP	ABNM	SMILE	HEAD/	SITAG	STANI	WALK	GRASI	SPEAK	NOWG	NOWF	NOWL	NOWS	NOWP	HCHE/	WTWE	LTLEN	MUAC	ZWTF(	ZWTF(	ZHTF(	ZBMIZ	ZHCZS	ZMUA	LIMBU	CPSPA	DYST(
2	2	2	1	2	12	0	0	0	0	0	0	3	6	6	8	3	48.0	13.2	97.0	14.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	2
2	2	2	1	2	12	0	0	0	0	0	0	3	6	9	0	9	41.5	9.1	86.0	13.5	-3.26	-4.44	-4.27	-2.57	-5.95	-2.21	60	2	1
2	1	2	1	1	3	18	30	48	0	24	12	12	18	36	36	24	47.2	15.9	106.0	16.2	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
2	1	2	1	1	3	5	10	18	20	0	0	36	30	24	36	24	51.5	22.6	105.0	19.5	3.48	1.84	-0.75	3.38	0.63	1.98	40	2	1
2	2	2	2	2	8	0	0	0	0	0	0	2	2	6	0	3	47.2	14.6	114.0	13.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	1
2	2	2	1	1	4	9	13	24	0	11	0	6	6	9	9	9	43.0	8.9	65.0	16.0	0.00	-2.92	-7.65	3.59	-3.97	0.63	31	1	1
2	2	2	1	1	4	5	0	0	0	9	0	3	9	12	8	5	47.5	9.4	77.0	13.5	-0.11	-0.76	-1.43	0.14	0.85	-0.89	51	2	1
2	2	2	2	2	3	0	0	0	0	0	0	2	2	9	7	9	39.2	7.8	85.0	12.7	-4.33	-5.04	-3.91	-4.04	-7.04	-2.79	60	2	1
2	1	1	1	1	18	8	0	0	0	0	18	8	12	3	6	3	47.0	9.9	77.0	14.3	0.00	-2.26	-4.24	0.86	-1.23	-0.93	50	1	1
2	2	2	1	2	5	12	24	42	42	12	42	1	2	2	2	2	48.4	15.6	103.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
2	2	2	2	1	8	0	0	0	0	0	0	3	3	3	3	0	42.2	8.8	73.0	15.0	-0.39	-1.10	-1.73	-0.10	-3.25	0.28	60	2	1
2	2	2	1	2	14	0	0	0	0	0	0	2	2	2	2	2	43.8	14.2	96.0	15.5	-0.05	-0.69	-1.13	0.04	-4.24	-0.37	60	2	1
2	2	2	1	2	6	12	0	0	0	60	60	3	9	3	6	9	51.0	23.3	120.0	17.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	1
2	2	2	1	1	5	12	24	0	0	24	24	9	9	24	12	24	48.3	17.0	93.0	15.5	2.82	0.53	-2.32	3.07	-1.22	-0.43	30	2	1
2	2	1	1	1	5	4	18	18	24	24	12	24	24	60	36	60	48.0	13.5	100.0	14.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
1	2	2	1	1	7	12	12	30	30	8	9	24	60	36	36	36	48.5	15.6	97.0	15.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
2	2	2	1	1	7	6	8	10	0	12	18	6	12	12	12	12	40.2	8.6	75.0	14.0	-0.59	-2.18	-3.29	-0.01	-4.90	-0.69	50	2	1
2	2	2	1	1	9	12	18	0	0	18	15	6	9	12	12	9	46.5	11.8	87.0	15.0	-0.20	-0.91	-1.47	0.01	-1.68	-0.37	40	1	1
2	2	2	1	1	5	8	0	0	0	0	0	3	3	3	3	3	40.5	8.4	76.0	12.5	-1.78	-3.36	-4.10	-0.99	-5.77	-2.56	60	2	1
2	2	2	1	1	18	0	0	0	0	0	0	6	3	3	6	6	45.5	20.6	103.0	22.5	2.69	2.45	1.11	2.67	-2.36	-2.36	60	2	1
2	2	2	1	1	6	9	18	18	23	12	0	12	12	9	12	12	42.7	8.7	79.0	13.0	-1.56	-2.20	-1.98	-1.35	-3.15	-1.64	40	2	1
2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	38.0	11.0	73.0	16.5	2.28	0.45	-2.76	2.82	-6.85	1.44	60	2	1
2	2	2	1	1	3	5	12	14	16	6	0	12	24	9	24	24	44.7	9.2	82.0	13.0	-2.03	-2.87	-2.66	-1.75	-2.87	-2.15	40	2	1
2	2	2	2	1	6	6	8	0	0	0	0	7	6	6	6	6	44.5	8.8	72.0	14.0	0.24	0.05	-0.28	0.27	-0.05	-0.14	40	2	1
2	2	2	1	1	2	0	0	0	0	24	24	3	24	36	9	36	45.2	9.2	88.0	12.5	-3.65	-4.72	-4.55	-2.91	-3.62	-3.32	40	2	2
2	2	2	1	1	4	7	12	18	0	12	15	0	0	6	0	6	42.2	7.2	75.0	12.3	-2.79	-3.70	-3.22	-2.32	-3.43	-2.29	60	2	2
2	2	2	2	1	5	14	0	0	0	18	0	3	3	3	3	3	42.8	6.4	71.0	12.0	-3.25	-3.63	-4.47	-2.60	-3.07	-2.65	60	2	2
1	2	2	1	1	8	15	8	0	0	18	30	6	9	12	12	12	45.8	13.1	94.0	14.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2	2
1	2	2	1	1	7	5	11	18	30	12	0	36	24	12	12	36	44.2	14.6	113.0	15.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	30	2	1
2	2	2	1	1	36	12	36	0	0	48	0	12	6	9	9	9	48.3	18.3	111.0	17.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	2
2	2	2	1	1	5	24	24	37	38	18	0	24	24	0	12	36	48.3	13.3	92.0	15.0	0.10	-1.14	-2.13	0.40	-1.08	-0.75	60	2	1
2	2	2	1	1	6	12	13	24	30	12	12	12	24	36	24	36	50.3	14.7	93.0	16.0	1.11	-0.43	-2.04	1.37	0.25	0.02	40	2	1
2	1	2	1	1	5	4	12	18	24	14	24	12	24	24	12	24	45.2	11.8	86.0	15.0	0.20	-1.93	-3.37	0.52	-2.70	-0.75	40	2	1
2	2	2	1	1	8	0	0	0	0	0	0	3	3	6	0	3	44.0	8.2	78.0	12.5	-1.88	-3.03	-2.92	-1.55	-2.41	-2.26	60	2	2
2	2	2	1	1	12	12	18	30	36	0	0	6	3	6	3	6	49.0	12.3	94.0	15.5	-1.33	-1.69	-1.48	-1.14	-0.55	-0.32	60	2	1
2	2	2	1	1	7	18	48	0	0	0	0	5	24	60	24	36	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	50	2	1
2	2	2	1	1	8	10	0	0	0	0	0	4	3	3	4	4	43.5	8.7	82.0	0.0	-2.20	-3.79	-3.66	-1.91	-3.57	0.00	60	2	1
2	1	1	1	1	3	12	13	48	48	24	11	12	12	36	36	36	47.0	15.3	103.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2	1
1	1	2	2	1	8	12	12	24	24	18	12	60	60	96	72	72	53.2	40.5	135.0	24.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	20	2	1
1	2	2	1	1	3	5	18	24	36	10	12	12	30	30	36	36	45.3	10.8	88.0	13.5	-1.18	-2.21	-2.35	-0.96	-2.39	-1.85	40	2	1
2	2	2	1	2	8	9	18	36	0	12	36	12	18	18	24	6	45.5	21.2	0.0	14.5	-9.00	-9.00	-9.00	0.00	-9.00	-9.00	20	2	1
2	2	1	1	1	3	12	18	24	36	18	0	24	12	9	12	9	46.2	13.9	98.0	16.0	-0.56	-1.21	-1.37	-0.53	-2.28	-0.24	20	2	1
2	2	2	1	1	9	12	30	0	0	24	18	9	24	24	12	36	46.8	13.1	95.0	15.0	-0.74	-2.41	-3.16	-0.38	-2.58	-1.09	50	2	2
2	1	2	1	1	0	0	8	12	18	0	18	36	60	48	60	60	48.0	14.8	103.0	14.8	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	30	2	1
2	2	2	1	2	20	3	0	0	0	36	0	3	3	6	9	4	44.0	11.8	100.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	1
2	2	2	1	1	6	8	0	0	0	15	0	9	9	6	7	9	46.0	8.9	75.0	13.5	-0.72	-2.67	-4.19	0.16	-1.65	-1.50	40	2	1
2	2	2	1	1	6	4	7	12	14	9	10	12	12	24	18	24	46.0	12.0	88.0	15.0	0.03	0.21	0.22	0.07	-0.95	0.04	20	2	1
2	2	2	2	1	4	0	0	0	0	0	24	6	6	6	6	6	46.0	19.1	112.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	0.00	60	2	1
2	2	2	1	1	6	8	12	0	0	0	0	12	9	9	0	9	42.2	12.4	96.0	15.0	-1.46	-2.77	-2.85	-1.30	-5.42	-1.26	20	2	1
2	2	2	1	1	42	12	0	0	0	0	48	12	0	6	2	0	46.3	13.9	101.0	16.5	-1.41	-1.88	-1.62	-1.29	-2.89	0.06	60	2	2
2	2	2	1	2	5	4	12	0	0	8	6	12	12	9	9	9	43.5	13.2	87.0	16.0	1.31	-0.31	-2.20	1.58	-3.51	0.29	20	2	1
2	2	2	1	1	10	12	18	24	30	9	18	9	36	36	36	36	49.0	14.3	98.0	16.2	-0.14	-1.59	-2.37	-0.11	-0.59	-0.37	40	2	1
2	2	2	1	1	3	7	24	24	36	12	30	9	24	12	18	24	47.5	4.8	83.0	15.0	-8.62	-7.23	-4.20	-8.37	-1.56	-0.71	51	1	1
2	2	2	1	1	8	18	24	30	0	0	30	6	12	12	9	9	43.5	8.0	74.0	13.0	-1.86	-4.07	-5.29	-0.80	-3.82	-2.21	51	2	1
2	2	2	2	2	8	6	12	24	48	0	48	60	60	48	0	60	48.5	28.6	128.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	0.00	20	2	1
2	2	2	1	2	0	0	0	0	0	0	0	3	3	3	3	3	45.5	10.7	91.0	13.2	-2.39	-2.55	-1.82	-2.11	-2.87	-2.29	60	2	2
2	2	2	1	1	8	5	24	36	36	12	24	8	18	12	12	9	43.3	8.7	82.0	0.0	-2.20	-0.08	3.49	-2.84	-1.02	0.00	50	2	1
2	2	2	1	1	6	5	7	12	18	9	18	36	36	36	12	36	46.5	19.8	122.0	14.2	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	30	2	1
2	2	2	1	2	3	0	0	0	0	0	0	3	3	3	3	3	43.7	10.2	76.0	15.0	0.60	-0.83	-2.69	1.20	-2.90	-0.08	60	2	1
2	2	2	1	1	12	4	12	14	16	18	36	12	9	24	36	24	48.2	36.1	155.0	20.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2	1
2	2	2	1	1	12	12	18	0	0	0	36	3	4	9	6	6	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	60	2	1
2	2	2	1	1	5	18	2	0	0	12	18	3	9	9	9	5	46.5	8.3	77.0	12.0	-2.30	-3.60	-3.89	-1.63	-1.50	-3.16	60	2	2
2	1	2	1	1	6	10	24	36	48	36	18	12	24	36	30	36	48.0	18.3	107.0	18.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2	1
2	2	2	1	1	12	24	24	36	0	42	60	12	18	12	36	24	47.7	23.7	125.0	18.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2	1
2	1	2	1	1	3	30	36	48	0	36	24	12	18	60	36	36	48.7	18.4	106.0	18.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2	2
2	1	2	1	1	4	6	12	24	30	12	18	10	24	30	36	36	49.7	13.4	93.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	0.00	40	2	1
2	2	2	2	1	6	0	0	0	0	0	0	4	4	4	4	4	41.3	10.0	84.0	0.0	-1.62	-4.41	-5.67	-0.76	-6.32	0.00	60	2	1
2	2	2	1	1	3	18	0	0	0	18	0	3	6	9	9	6	45.5	7.9	74.0	11.5	-2.02	-3.73	-4.56	-1.12	-2.04	-3.57	60	2	2
2	2	2	1	1	7	8	24	36	42	24	12	18	18	36	12	36	48.3	16.4	104.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
2	2	2	1	1	7	8	12	24	30	12	12	12	36	24	12	24	43.0	11.7	101.0	12.8	-3.50	-3.00	-1.30	-3.42	-5.04	-2.99	50	2	1
2	2	2	1	1	4	5	13	0	0	0	18	4	9	9	3	5	44.8	8.9	79.0	14.0	-1.79	-1.85	-1.16	-1.67	-1.92	-0.76	60	2	1
2	2	2	1	2	3	0	0	0	0	12	0	3	6	9	7	5	49.5	12.3	97.0	14.0	-1.98	-2.76	-2.49	-1.69	-0.71	-1.90	60	2	1
2	2	2	1	1	4	0	0	0	0	0	0	3	6	6	2	2	43.2	8.4	76.0	0.0	-1.31	-1.83	-1.78	-1.02	-2.33	0.00	60	2	2
2	2	2	1	1	6	12	0	0	0	0	0	3	1	12	8	24	46.7	12.2	94.0	14.0	-1.43	-2.39	-2.48	-1.10	-2.43	-1.77	60	1	1
2	2	2	1	1	7	0	0	0	0	0	0	2	0	6	0	2	50.0	12.6	99.0	0.0	-2.11	-2.64	-2.16	-1.89	-0.40	0.00	60	2	2
2	2	2	1	1	7	4	18	24	30	24	0	12	24	6	24	36	45.0	9.6	84.0	12.7	-2.11	-1.18	0.78	-2.40	-1.80	-2.03	60	2	1
2	1	2	1	1	6	9	30	54	60	24	18	12	24	36	12	36	47.5	17.0	107.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	0.00	60	2	1
2	2	2	2	1	18	12	24	0	0	0	0	3	0	6	2	3	42.5	8.4	81.0	11.0	-3.00	-3.82	-3.35	-2.61	-4.60	-4.31	60	2	1
2	1	2	1	1	6	24	24	0	0	60	36	10	60	60	12	48	54.0	0.0	0.0	25.0	0.00	0.00	0.00	0.00	-9.00	-9.00	40	2	1
2	1	2	1	1	6	6	9	24	0	10	10	9	24	36	12	36	45.5	12.3	87.0	15.5	0.54	-1.09	-2.52	0.82	-2.22	-0.17	50	1	1
2	2	2	1	1	0	0	0	0	0	0	0	2	1	3	2	4	43.7	8.5	76.0	13.0	-1.69	-3.10	-3.75	-0.97	-3.30	-1.96	60	2	2
2	2	1	1	1	5	5	11	18	20	12	11	12	12	12	12	18	45.0	9.0	80.0	14.0	-1.84	-2.58	-2.46	-1.52	-2.35	-1.00	40	1	1
2	2	2	1	1	3	0	24	36	0	24	10	8	24	60	9	36	43.5	16.6	103.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2	1
2	1	2	1	1	5	7	9	30	36	10	12	48	48	48	48	48	51.0	16.3	110.0	15.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2	2
2	2	2	1	1	5	12	24	0	0	24	0	3	4	9	2	4	41.5	7.9	75.0	13.0	-1.68	-3.19	-3.56	-1.11	-4.08	-1.69	60	2	2
2	2	2	1	1	3	3	24	60	72	12	96	60	60	12	36	36	51.0	39.7	144.0	24.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	1	1
2	2	2	1	1	6	18	24	96	102	24	18	12	60	60	60	60	48.2	0.0	129.0	0.0	0.00	0.00	-9.00	0.00	-9.00	0.00	51	1	1
2	2	1	1	1	6	24	48	72	78	24	12	12	24	30	24	36	50.5	23.2	123.0	18.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	1	1
2	1	2	1	1	4	8	8	18	0	6	9	12	30	36	24	24	47.5	14.5	99.0	15.2	-0.19	-0.50	-0.62	-0.20	-1.17	-0.66	50	2	1
2	2	2	1	1	3	6	18	30	30	10	10	18	30	48	36	36	47.0	15.1	104.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2	1
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2	2	2	1	1	12	15	24	40	0	24	36	12	12	12	18	12	46.8	12.3	92.0	15.0	-0.60	-1.73	-2.22	-0.40	-1.64	-1.80	60	2	1
2	2	2	1	2	8	12	0	0	0	17	0	4	6	6	3	3	45.2	9.7	82.0	15.0	-1.36	-1.79	-1.55	-1.21	-2.12	-0.07	60	2	2

DYSKI	ATAXA	CEREE	STERE	MOBII	HMFH	NEUR	CNINV	DYSM	EYESE	CVICO	DROOI	SWALI	CARIE	CHEST	HIPHI	SPINES	BEHAV	FTTFA	CONTI	URINE	BOWE	HEARI	AUTSN	ANEM	GERD	NEUR	METAI	CPTRE	GM
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MACS	CFCS1	COMM	DLSSD	SOCSS	MOTO	ABCAI	FEBSZ	PROVK	SEIZFR	DURAS	STATU	AEDST	COMP	DURAI	NUMA	DIURV	SLEEP	SYMP	ICTAL	DEFIC	EEG1E	EEGAE	INTER	MARK	BACK	DUREI	CPTYP	CERV
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1	1	63	60	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
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1	1	65	52	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	2	1	
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2	1	94	85	89	56	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
1	1	55	61	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
5	5	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	1	1	
1	1	63	62	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
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1	2	0	0	73	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	2	1	
2	1	64	63	67	42	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
3	4	54	64	57	44	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	1	1	
5	5	0	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	2	1	

PERILI	DEEPN	ENCEF	STROK	PERIC	ULGUI	CEREE	MALF	CORPT	METCI	ENCEF	INFEC	HYDR	OTROT	KUPP3	SOC2C	MURE	AGEOI	Zscore	Zscore	Zscore	ZWTfo	filter_$
1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.00	1.00	2.00	0.00	1.00	1.00	1.00	1.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	1
1	1	1	1	1	1	1	1	1	1	1	1	2	1	3.00	1.00	5.00	1.00	1.00	2.00	2.00	2.00	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	3.00	0.00	1.00	1.00	1.00	1.00	0
1	1	1	1	1	1	1	2	2	3	1	1	1	1	1.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	3.00	0.00	1.00	1.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	2	1	1.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	0
2	2	1	1	2	1	1	1	2	1	1	1	1	1	2.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1
1	1	2	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	1.00	1.00	2.00	1.00	1.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
1	1	2	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	5.00	0.00	1.00	1.00	2.00	1.00	0
2	1	1	1	1	1	1	1	2	1	1	1	1	1	3.00	1.00	2.00	0.00	2.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	2.00	0.00	2.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	2	1	1	1	1	1	1	3.00	1.00	3.00	0.00	1.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	1.00	1.00	1.00	0
1	2	2	1	1	2	1	1	2	1	1	1	1	1	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	1.00	1.00	2.00	1.00	1.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	2.00	0.00	1.00	2.00	2.00	2.00	0
1	1	2	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	1.00	1.00	2.00	1.00	1.00	1
2	1	1	1	1	1	1	1	1	1	1	1	2	1	3.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
2	1	1	1	1	1	1	1	2	1	1	1	1	1	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	1
2	2	1	1	1	1	1	1	2	1	1	1	1	1	2.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	1
1	2	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
1	1	2	1	2	2	1	1	1	1	1	1	1	1	3.00	2.00	5.00	5.00	2.00	2.00	2.00	2.00	1
1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	1
1	2	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	1.00	1.00	1.00	2.00	1.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	1.00	2.00	1.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	2.00	0.00	1.00	2.00	2.00	1.00	0
1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00	0
1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	1.00	1.00	1.00	1.00	0
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2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	1.00	1.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	3.00	5.00	2.00	2.00	2.00	2.00	1
1	1	1	2	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
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1	1	2	2	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00	1
1	1	2	2	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	1.00	1.00	2.00	1.00	1.00	1
2	1	1	1	2	1	1	1	2	1	1	1	1	1	3.00	2.00	2.00	5.00	1.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	2.00	0.00	2.00	2.00	2.00	2.00	0
2	1	2	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	2	2.00	1.00	2.00	0.00	1.00	1.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	2	3.00	1.00	3.00	0.00	1.00	1.00	1.00	1.00	0
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2	2	1	1	1	1	1	1	1	1	1	1	1	2	3.00	2.00	4.00	3.00	1.00	2.00	1.00	1.00	1
2	1	1	1	1	1	1	1	2	1	1	1	1	1	3.00	2.00	3.00	2.00	1.00	2.00	2.00	1.00	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	0.00	1.00	1.00	2.00	1.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	2.00	1.00	2.00	2.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	2.00	2.00	2.00	0
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2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	1.00	1.00	1.00	0
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1	1	1	1	1	1	1	2	1	1	1	1	1	1	2.00	2.00	1.00	0.00	2.00	2.00	2.00	2.00	0
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2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	2.00	2.00	1.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	1.00	1.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	2	1	1	1	1	1	1.00	1.00	2.00	0.00	1.00	2.00	2.00	2.00	0
2	1	1	1	2	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	1.00	2.00	2.00	2.00	2.00	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1.00	2.00	0.00	2.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00	0
2	1	2	1	2	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	2.00	0.00	1.00	2.00	2.00	1.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	1.00	1.00	1.00	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00	0
1	1	1	1	1	1	2	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.00	1.00	5.00	0.00	2.00	2.00	2.00	2.00	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	5.00	0.00	2.00	2.00	2.00	2.00	0
1	2	2	1	1	2	2	1	1	1	1	1	1	1	1.00	2.00	3.00	3.00	1.00	2.00	2.00	2.00	1
1	1	1	1	1	1	2	1	1	1	1	1	1	1	3.00	1.00	3.00	0.00	1.00	1.00	2.00	1.00	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	2.00	2.00	0.00	1.00	1.00	1.00	1.00	0
2	2	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	1.00	2.00	1.00	0
1	2	1	1	1	1	1	1	1	1	1	1	1	2	3.00	2.00	3.00	0.00	1.00	2.00	1.00	1.00	0

104	4.00	2	2	2	40.00	3	60.00	60.00	3	02-Jul-2015	12	2	4	3.00	3.00	2	1	4	0	2,500	40.0
105	3.00	1	1	2	21.00	3	21.00	21.00	2	22-Nov-2013	31	0	0	3.00	3.00	0	0	0	0	1,200	28.3
106	0.00	1	1	2	21.00	2	60.00	60.00	2	25-Apr-2014	26	0	0	3.00	3.00	0	0	0	0	3,090	40.0
107	0.00	1	1	2	21.00	3	21.00	21.00	2	29-Sep-2013	33	0	0	2.00	2.00	0	0	0	0	1,200	27.3
108	0.00	1	1	2		1	23.00		2	10-Jul-2011	59	0	0	2.00	2.00	0	0	0	0	2,500	37.0
109	0.00	1	1	2	31.00	3	23.00	23.00	2	07-Nov-2013	32	0	0	3.00	3.00	0	0	0	0	2,250	40.0
110	1.00	1	2	2	31.00	3	23.00	23.00	2	26-Feb-2014	28	0	0	7.00	6.00	0	0	0	0	3,600	40.0
112	0.00	1	1	2	31.00	3	23.00	23.00	2	20-Oct-2014	20	0	0	4.00	4.00	0	0	0	0	2,285	33.3
113	1.00	1	1	2	33.00	5	60.00	60.00	2	26-May-2011	61	0	0	2.00	2.00	0	0	0	0	2,500	40.0
114	1.00	1	2	2	21.00	3	23.00	23.00	2	01-Jun-2004	145	0	0	2.00	2.00	0	0	0	0	2,200	40.0
115	0.00	1	1	2	21.00	3	23.00	23.00	2	30-Oct-2014	20	0	0	2.00	2.00	0	0	0	0	2,200	37.0
116	3.00	2	2	2		2	21.00		2	25-Apr-2014	26	12	1	3.00	3.00	2	1	1	0	1,350	32.0
117	1.00	1	1	2		2	23.00		2	22-Jun-2013	36	0	0	3.00	3.00	0	0	0	0	3,500	40.0
118	0.00	1	1	2	21.00	3	23.00	23.00	2	25-May-2014	25	0	0	8.00	5.00	0	0	0	0	3,200	40.0
119	1.00	2	1	2	32.00	3	23.00	23.00	2		144	36	4	2.00	2.00	1	1	4	0		40.0
120	0.00	1	1	2	21.00	3	23.00	23.00	2	01-Jun-2011	61	0	0	2.00	2.00	0	0	0	0	2,500	40.0
121	0.00	1	1	2	21.00	3	60.00	60.00	2	17-Oct-2011	57	0	0	3.00	3.00	0	0	0	0	2,400	36.0
122	1.00	2	1	2	21.00	3	22.00	22.00	2	20-Jun-2015	13	12	3	3.00	3.00	2	1	3	0	1,950	40.0
123	0.00	1	2	1	32.00	3	23.00	23.00	2	05-Jun-2012	49	0	0	7.00	6.00	0	0	0	0	2,800	40.0
124	4.00	2	1	1	21.00	3	21.00	21.00	2	24-Apr-2013	39	18	3	2.00	2.00	1	1	3	0	1,020	31.6
125	1.00	1	1	2	31.00	3	23.00	23.00	2	10-Oct-2010	69	0	0	3.00	3.00	0	0	0	0	2,900	36.0
126	1.00	1	1	2	21.00	3	21.00	21.00	2	24-Feb-2012	53	0	0	3.00	3.00	0	0	0	0	2,000	32.0
128	0.00	1	1	2	21.00	6	27.00	21.00	2	13-Apr-2015	14	0	0	2.00	2.00	0	0	0	0	1,940	35.5
129	0.00	1	1	2		1	28.00		4	16-Jun-2011	61	0	0	1.00	1.00	0	0	0	0	3,000	40.0
130	1.00	2	1	2	31.00	3	21.00	21.00	2	23-Mar-2014	28	12	1	7.00	6.00	1	1	1	0	1,100	28.0
131	0.00	1	1	2	40.00	3	60.00	60.00	2	10-Jan-2005	138	0	0	2.00	2.00	0	0	0	0	2,900	40.0
132	0.00	1	1	2	31.00	3	23.00	23.00	2	15-Mar-2015	16	0	0	7.00	6.00	0	0	0	0	2,300	40.0
133	1.00	2	2	1		2	21.00		2	27-Aug-2007	107	12	4	2.00	2.00	1	1	4	0	1,900	32.0
134	1.00	1	1	2		2	21.00		2	18-Mar-2005	136	0	0	3.00	3.00	0	0	0	0	1,500	34.0
135	3.00	2	2	2	21.00	3	21.00	21.00	2	21-Nov-2012	68	3	1	3.00	3.00	1	1	1	0	1,700	32.0
136	0.00	1	1	2		1	21.00		2	27-Aug-2009	83	0	0	3.00	3.00	0	0	0	0	1,700	28.0
137	0.00	2	2	2	32.00	3	23.00	23.00	2	24-Jan-2013	42	1	4	3.00	3.00	1	1	4	0	3,600	40.4
138	3.00	2	2	2	31.00	3	23.00	23.00	2	08-Aug-2011	59	18	3	7.00	6.00	2	1	3	0	3,000	40.0
139	0.00	2	2	2		1	23.00		2	02-Oct-2001	177	72	4	7.00	6.00	1	1	4	0		36.0
140	0.00	1	1	2		2	21.00		2	08-Oct-2011	57	0	0	2.00	2.00	0	0	0	0	1,300	28.0
141	0.00	1	2	2		2	21.00		2	12-Jan-2011	66	0	0	2.00	2.00	0	0	0	0	1,500	36.0
142	0.00	1	1	2	33.00	3	29.00	29.00	3	19-May-2007	110	0	0	1.00	1.00	0	0	0	0	3,500	40.0
143	3.00	2	1	2	31.00	3	23.00	23.00	2	12-Mar-2009	89	30	7	7.00	6.00	1	2	0	1	3,000	40.0
144	3.00	2	1	2	50.00	3	23.00	23.00	2	23-Sep-2013	35	24	1	1.00	1.00	1	1	1	0	2,300	38.0
145	1.00	1	1	2		2	23.00		2	07-Aug-2008	96	0	0	7.00	6.00	0	0	0	0	5,000	40.0
147	2.00	2	2	1		2	23.00		2	01-Feb-2014	30	1	4	3.00	3.00	1	1	4	0	3,000	40.0
148	4.00	2	2	1		2	23.00		2	14-Sep-2014	23	5	3	7.00	6.00	2	1	3	0	2,700	40.0
149	1.00	2	1	1		2	21.00		2	27-Apr-2010	75	1	1	3.00	3.00	1	1	1	0	1,600	32.0
150	0.00	1	1	2	21.00	5	23.00	2,324.00	2	24-Sep-2015	18	0	0	7.00	6.00	0	0	0	0	2,840	36.0
151	0.00	1	1	2	32.00	3	24.00	2,422.00	2	09-Aug-2014	24	0	0	2.00	2.00	0	0	0	0	2,300	40.0
152	1.00	2	2	1	21.00	3	27.00	23.00	2	27-Oct-2014	22	9	3	3.00	3.00	1	1	3	0	2,500	36.0
153	1.00	1	1	2		2	21.00		2	20-Apr-2011	64	0	0	3.00	3.00	0	0	0	0	1,720	32.0
154	0.00	1	1	2	50.00	3	28.00	28.00	2	07-Aug-2015	12	0	0	7.00	6.00	0	0	0	0	3,000	40.0
155	0.00	1	1	2	21.00	6	23.00	23.00	2	03-Feb-2015	18	0	0	3.00	3.00	0	0	0	0	2,750	40.0
156	1.00	1	2	2	21.00	3	27.00	27.00	2	25-Mar-2015	17	0	0	2.00	2.00	0	0	0	0	2,750	36.0
157	0.00	2	1	1	32.00	3	23.00	23.00	2	03-Sep-2013	36	6	4	3.00	3.00	1	1	4	0	3,000	40.0
158	2.00	2	2	2	40.00	5	41.00	41.00	3	26-Feb-2015	18	18	4	1.00	1.00	1	1	4	0	3,000	40.0
159	0.00	1	1	2	21.00	3	23.00	23.00	2	04-Jul-2014	26	0	0	2.00	2.00	0	0	0	0	2,100	40.0
160	1.00	1	2	2	21.00	5	23.00	23.00	1	16-Nov-2011	57	0	0	3.00	3.00	0	0	0	0	2,200	40.0
161	2.00	2	1	1	40.00	3	23.00	23.00	2	17-Nov-2013	33	6	3	3.00	3.00	2	1	3	0	2,100	40.0
162	2.00	1	2	2	32.00	3	27.00	27.00	2	23-Oct-2014	22	0	0	7.00	6.00	0	0	0	0	3,000	40.0
163	2.00	2	1	1	40.00	3	23.00	23.00	2	09-Nov-2011	58	12	3	7.00	6.00	2	1	3	0	3,000	40.0
164	2.00	1	1	2	21.00	3	22.00	22.00	2	28-Apr-2012	52	0	0	3.00	3.00	0	0	0	0	2,000	40.0
165	2.00	2	1	2	21.00	4	21.00	21.00	4	08-May-2014	28	24	2	3.00	3.00	1	1	2	0	1,200	30.1
166	1.00	2	2	1	21.00	3	23.00	2,324.00	2	27-Aug-2013	37	1	3	3.00	3.00	1	1	3	0	2,750	40.0
167	2.00	2	2	2	32.00	3	23.00	23.00	2	16-May-2008	100	1	4	3.00	3.00	2	1	4	0	2,900	32.0
168	1.00	1	2	2	31.00	5	26.00	26.00	3	25-May-2015	15	0	0	4.00	4.00	0	0	0	0	2,200	40.0
169	2.00	2	2	2		2	23.00		2	20-Mar-2014	29	1	3	3.00	3.00	1	1	3	0	2,500	40.0
170	0.00	1	2	0		1	23.00	23.00	2	13-May-2013	40	0	0	3.00	3.00	0	0	0	0	3,500	40.0
171	0.00	1	1	2	31.00	3	23.00	23.00	2	18-Mar-2012	53	0	0	7.00	6.00	0	0	0	0	2,400	40.0
172	3.00	2	1	2	23.00	3	28.00	28.00	3	04-Jul-2012	50	4	3	3.00	3.00	1	1	3	0	3,000	36.0
173	1.00	1	1	2		2	23.00		2	07-May-2013	40	0	0	2.00	2.00	0	0	0	0	2,800	40.0
174	1.00	2	1	2	31.00	5	23.00	23.00	2	01-Dec-2011	57	18	4	7.00	6.00	1	1	4	0	2,450	40.0
176	1.00	2	1	2		2	25.00		2	14-Feb-2010	79	12	4	3.00	3.00	1	1	4	0	4,500	40.0
177	0.00	1	1	2	31.00	3	23.00	23.00	2	19-May-2012	51	0	0	7.00	6.00	0	0	0	0	2,400	40.0
178	1.00	1	2	2		2	23.00		2	31-Oct-2013	35	0	0	3.00	3.00	0	0	0	0	3,500	40.0
179	1.00	2	1	2		1	23.00		2	04-May-2010	76	24	4	7.00	6.00	1	1	4	0	2,700	40.0
181	0.00	1	1	2		2	23.00		2	09-May-2012	52	0	0	1.00	1.00	0	0	0	0	2,500	40.0
182	1.00	1	1	2	21.00	3	21.00	21.00	1	20-Apr-2011	65	0	0	7.00	6.00	0	0	0	0	1,400	28.0
184	0.00	1	2	2		2	21.00		2	30-Aug-2010	72	0	0	2.00	2.00	0	0	0	0	2,000	28.0
185	0.00	1	2	2	21.00	3	23.00	23.00	2	14-Mar-2015	18	0	0	3.00	3.00	0	0	0	0	3,000	35.0
186	2.00	2	2	2	32.00	4	23.00	23.00	2	26-Mar-2012	54	1	5	3.00	3.00	2	1	5	0	2,500	40.0
187	0.00	1	1	2		2	21.00		3	10-May-2011	64	0	0	3.00	3.00	0	0	0	0	3,000	40.0
188	1.00	2	2	2	31.00	3	23.00	23.00	2	03-Apr-2015	17	1	4	7.00	6.00	1	1	4	0	3,500	38.0
190	0.00	1	1	2		1	21.00		2	01-Jan-2008	104	0	0	3.00	3.00	0	0	0	0	1,000	40.0
191	0.00	1	2	2	31.00	3	26.00	26.00	2	12-Aug-2015	13	0	0	7.00	6.00	0	0	0	0	1,800	36.0
192	1.00	1	1	2	21.00	4	27.00	27.00	2	07-Feb-2014	31	0	0	2.00	2.00	0	0	0	0	3,000	40.0
193	0.00	1	1	2	31.00	3	26.00	26.00	2	16-Nov-2010	70	0	0	7.00	6.00	0	0	0	0	2,500	37.0
194	1.00	2	2	1		2	23.00		2	16-May-2013	40	5	3	3.00	3.00	1	1	3	0	3,600	40.0
195	0.00	1	1	2	50.00	3	21.00	21.00	2	29-Dec-2008	93	0	0	2.00	2.00	0	0	0	0	3,600	40.0
196	0.00	1	1	2	32.00	3	23.00	23.00	2	05-Aug-2012	49	0	0	3.00	3.00	0	0	0	0	3,000	40.0
197	1.00	1	1	2	50.00	5	23.00	23.00	2	24-Oct-2007	107	0	0	4.00	4.00	0	0	0	0	2,750	32.0
198	0.00	1	1	2	31.00	3	27.00	27.00	2	07-Nov-2014	22	0	0	3.00	3.00	0	0	0	0	2,900	40.0
199	1.00	1	1	2	32.00	3	41.00	41.00	4	25-Aug-2009	85	0	0	1.00	1.00	0	0	0	0	3,200	40.0
200	0.00	1	1	2	31.00	3	27.00	27.00	2	17-Jun-2015	15	0	0	7.00	6.00	0	0	0	0	3,100	40.0
201	0.00	2	1	1		2	13.00		1	14-May-2012	52	12	3	4.00	4.00	1	1	3	0	2,500	40.0
202	1.00	2	2	2	21.00	3	23.00	23.00	2	04-May-2013	40	1	4	3.00	3.00	1	1	4	0	2,600	40.0
203	1.00	1	1	2	11.00	3	14.00	14.00	1	20-Mar-2014	30	0	0	4.00	4.00	0	0	0	0	2,250	35.0
204	1.00	1	1	2	50.00	3	23.00	23.00	2	25-Oct-2010	71	0	0	3.00	3.00	0	0	0	0	3,250	40.0
205	0.00	1	2	2	31.00	3	23.00	23.00	2	24-Mar-2010	78	0	0	7.00	6.00	0	0	0	0	2,300	37.0
206	0.00	1	1	2	21.00	3	23.00	21.00	2	08-Nov-2014	23	0	0	3.00	3.00	0	0	0	0	1,450	32.0
207	3.00	1	1	2		2	23.00		2	06-Sep-2013	36	0	0	3.00	3.00	0	0	0	0	2,700	40.0
208	0.00	1	1	2	21.00	3	21.00	21.00	1	18-Dec-2014	21	0	0	2.00	2.00	0	0	0	0	1,500	28.0
209	3.00	1	1	2	21.00	3	23.00	23.00	2	03-Feb-2005	139	0	0	2.00	2.00	0	0	0	0	2,300	37.0
210	3.00	2	1	2		2	22.00		2	22-Apr-2011	65	41	4	3.00	3.00	1	1	4	0	1,180	33.3
211	0.00	1	1	2	31.00	3	26.00	26.00	2	17-Feb-2007	115	0	0	5.00	4.00	0	0	0	0	1,700	40.0
212	3.00	2	1	2	40.00	5	60.00	60.00	1	25-May-2010	77	12	4	3.00	3.00	1	1	4	0		
213	1.00	2	2	1		1	23.00		2	19-Mar-2015	18	1	3	3.00	3.00	1	1	3	0	3,500	40.0

5	6	2	2	2	4	1	1	1	1	1	1	1	1	1	1	1	2	2	1	33.9	45.9	1	1	99	1	1	1		
6	7	2	1	2	2	1	1	1	1	2	1	1	2	1	2	1	2	2	1	30.9	35.9	1	1	99	1	1	3		
7	7	5	1	2	2	1	1	1	1	1	1	1	1	1	4	1	1	2	1	33.9	45.9	1	1	99	1	1	1		
7	7	4	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	1	30.9	35.9	1	1	99	1	1	4		
5	6	4	1	2	3	1	1	1	1	1	1	1	1	1	1	1	2	2	1	33.9	45.9	1	4	99	1	1	3		
3	4	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	33.9	45.9	1	4	99	1	1	2		
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2	2	1	1	1	5	3	24	0	0	0	0	7	4	6	0	4	41.5	16.8	100.0	17.7	1.20	0.20	-0.98	1.16	-5.57	0.91	60	2
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2	2	2	1	1	2	0	0	0	0	0	0	2	2	2	2	2	42.5	5.3	65.0	0.0	-3.95	-5.49	-5.80	-3.54	-3.39	0.00	60	1
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2	2	2	1	1	12	42	0	0	0	0	42	2	4	9	0	3	49.5	11.9	92.0	13.5	-1.31	-2.81	-3.28	-0.82	-0.61	-2.29	60	2
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2	2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	46.0	8.0	73.0	12.0	-1.54	-2.69	-3.27	-0.95	-0.96	-2.73	60	2
2	2	2	1	1	3	36	48	0	0	24	36	7	9	36	9	12	49.5	19.8	110.0	18.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2
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2	2	2	1	1	6	0	0	0	0	0	0	5	9	9	0	5	47.0	11.0	89.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
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1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	2.00	1.00	1.00	2.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.00	1.00	3.00	0.00	1.00	1.00	1.00	1.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00
1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	3.00	0.00	1.00	1.00	2.00	2.00
1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	2	1	1	1	2	1	1	1	1	1	1.00	2.00	3.00	3.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	2.00	0.00	1.00	1.00	2.00	1.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00
1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	2.00	1.00	1.00
1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00
1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	3.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00
1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	3.00	0.00	1.00	2.00	2.00	2.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1.00	2.00	5.00	0.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	2.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	1.00	1.00	1.00	1.00	1.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1.00	2.00	2.00	1.00	1.00	2.00	1.00	1.00
1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	2.00	1.00	2.00	2.00	2.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2.00	3.00	5.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	2.00	0.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	3.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2.00	2.00	3.00	2.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	3.00	2.00	2.00	2.00	2.00
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2.00	2.00	3.00	2.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	2.00	3.00	0.00	1.00	2.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	2.00	0.00	1.00	1.00	2.00	2.00
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3.00	1.00	3.00	0.00	2.00	2.00	2.00	2.00
1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00

361	0.00	1	1	2	21.20	2	23.00	23.00	2	29-May-2012	55	0	0	2.00	2.00	0	0	0	0	2,150	32.0	1
362	2.00	2	2	2	32.20	2	27.00	27.00	2	07-Feb-2010	71	9	3	3.00	3.00	1	1	3	0	2,750	40.0	2
363	0.00	1	1	2	11.00	3	11.00	11.00	1	21-Jul-2015	17	0	0	8.00	5.00	0	0	0	0	2,900	40.0	2
364	0.00	1	1	2	31.00	3	23.00	23.00	2	07-Sep-2014	28	0	0	7.00	6.00	0	0	0	0	3,000	40.0	2
365	1.00	1	1	2	60.00	3	23.00	6,123.00	6	30-Sep-2013	40	0	0	3.00	3.00	0	0	0	0	2,250	40.0	2
366	0.00	2	2	2	2,140.00	3	60.00	60.00	4	01-Jan-2003	168	30	4	2.00	2.00	1	1	4	0	2,500	40.0	1
367	0.00	2	1	2		1	60.00	60.00	2	01-Mar-2007	119	48	1	2.00	2.00	1	1	1	0	2,000	40.0	1
368	0.00	1	1	2	21.00	3	21.00	21.00	2	14-Mar-2013	46	0	0	3.00	3.00	0	0	0	0	1,350	30.5	1
369	2.00	2	1	2	32.00	3	23.00	23.00	2	10-Feb-2015	23	7	4	3.00	3.00	1	1	4	0	2,500	40.0	1
370	0.00	1	1	2	11.00	3	13.00	13.00	2	15-Feb-2012	60	0	0	2.00	2.00	0	0	0	0	1,460	36.1	1
371	2.00	2	1	2		2	23.00		2	22-Oct-2010	75	6	4	3.00	3.00	2	1	4	0	2,400	40.0	1
372	1.00	1	1	2	50.00	3	26.00	26.00	2	22-Nov-2010	75	0	0	5.00	4.00	0	0	0	0	2,500	40.0	1
373	0.00	1	1	2	31.00	3	26.00	26.00	2	05-Aug-2015	17	0	0	4.00	4.00	0	0	0	0	2,250	39.0	2
374	0.00	1	1	2	12.00	5	14.00	14.00	1	07-Nov-2015	14	0	0	3.00	3.00	0	0	0	0	2,700	39.0	2
375	2.00	2	1	2		2	60.00		1	17-Nov-2012	50	8	3	3.00	3.00	2	1	3	0	3,300	39.0	1
376	2.00	2	2	2	32.00	3	23.00	23.00	2	15-Sep-2002	172	10	4	1.00	1.00	1	1	4	0	3,000	40.0	2
377	2.00	2	2	2		2	24.00		3	04-Mar-2003	167	12	4	3.00	3.00	1	1	4	0	2,500	40.0	1
378	0.00	1	1	2	21.00	3	21.00	21.00	4	24-Mar-2009	94	0	0	1.00	1.00	0	0	0	0	1,250	28.0	1
379	1.00	1	1	2	21.00	3	27.00	27.00	2	20-Nov-2010	75	0	0	7.00	6.00	0	0	0	0	2,040	33.5	2
380	4.00	2	2	2	21.00	3	21.00	2,124.00	3	07-Feb-2016	12	1	3	3.00	3.00	2	1	3	0	1,500	40.0	2
381	3.00	1	2	2	50.00	3	26.00	26.00	2	17-Nov-2014	27	0	0	4.00	4.00	0	0	0	0	1,456	34.0	1
382	3.00	1	1	2	21.00	5	21.00	21.00	2	22-Jul-2014	30	0	0	3.00	3.00	0	0	0	0	1,700	28.0	1
383	2.00	2	1	2	32.20	5	23.00	23.00	2	12-Sep-2013	40	9	3	3.00	3.00	2	1	3	0	2,800	40.4	2
384	1.00	2	2	1	32.00	3	23.00	23.00	2	13-Sep-2014	28	6	3	3.00	3.00	2	1	3	0	2,500	40.2	1
385	2.00	2	2	2	32.00	5	23.00	23.00	1	20-Oct-2007	112	24	7	3.00	3.00	2	2	0	1	3,500	40.0	2
386	2.00	2	1	2	31.00	5	23.00	23.00	2	14-Aug-2011	66	2	3	7.00	6.00	1	1	3	0	3,000	38.0	1
388	3.00	1	2	2	3,121.00	3	23.00	23.00	2	09-Aug-2014	30	0	0	7.00	6.00	0	0	0	0	2,750	40.0	1
389	1.00	1	1	2	31.00	5	41.00	41.00	4	04-Sep-2011	64	0	0	1.00	1.00	0	0	0	0	2,500	37.6	2
390	1.00	1	1	2	21.00	3	23.00	23.00	2	27-Sep-2011	64	0	0	7.00	6.00	0	0	0	0	3,400	40.0	1
391	0.00	1	1	2		1	28.00		4	20-Jul-2014	30	0	0	1.00	1.00	0	0	0	0	2,300	32.0	1
392	0.00	1	1	2		1	60.00		2	21-Jan-2016	12	0	0	2.00	2.00	0	0	0	0	2,700	36.0	2
393	1.00	2	1	2	3,240.00	5	25.00	25.00	2	11-Jun-2015	20	6	3	1.00	1.00	1	1	3	0	3,600	40.0	1
394	2.00	2	1	2		1	23.00		2	29-Dec-2014	25	8	2	3.00	3.00	2	1	2	0	3,000	40.0	1
395	2.00	2	1	2		2	23.00		2	20-Oct-2015	16	6	4	3.00	3.00	2	1	4	0	3,200	40.0	1
396	0.00	1	1	2	21.20	2	21.00	2,123.00	2	15-Sep-2013	41	0	0	3.00	3.00	0	0	0	0	1,700	28.0	1
397	2.00	2	1	2	32.00	5	23.00	23.00	2	09-Feb-2009	96	6	4	3.00	3.00	2	1	4	0	2,950	38.0	1
398	2.00	1	1	2	23.00	3	21.00	21.00	2	20-Apr-2013	46	0	0	2.00	2.00	0	0	0	0	1,500	30.0	1
399	0.00	1	2	2		1	23.00		2	23-Jun-2008	103	0	0	2.00	2.00	0	0	0	0	2,700	40.0	1
400	3.00	2	1	1	40.00	3	21.00	2,141.00	2	09-Dec-2003	158	84	4	3.00	3.00	2	1	4	0	1,250	28.0	2
401	0.00	1	2	2	21.00	3	23.00	23.00	1	24-Dec-2014	25	0	0	3.00	3.00	0	0	0	0	2,450	40.0	1
402	0.00	1	2	2		2	28.00		2	27-Jan-2014	37	0	0	1.00	1.00	0	0	0	0	3,000	40.0	1
403	0.00	1	1	2	21.00	3	23.00	23.00	2	29-May-2008	104	0	0	4.00	4.00	0	0	0	0	2,500	40.0	1
404	1.00	1	1	2		2	21.00		2	04-Dec-2014	26	0	0	2.00	2.00	0	0	0	0	2,000	32.0	1
405	2.00	1	1	2	32.00	3	23.00	23.00	1	01-Oct-2010	76	0	0	3.00	3.00	0	0	0	0	3,000	40.0	2
406	0.00	1	1	2	31.00	5	23.00	23.00	1	11-Jan-2016	13	0	0	7.00	6.00	0	0	0	0	2,500	40.0	1
407	0.00	1	1	2	2,140.00	3	14.00	1,460.00	2	17-Oct-2013	40	0	0	2.00	2.00	0	0	0	0	2,250	40.0	2
408	4.00	1	1	2		1	22.00		1	01-Dec-2014	26	0	0	3.00	3.00	0	0	0	0	2,100	38.0	1
409	1.00	2	2	1		1	23.00		2	03-Jul-2008	103	12	4	3.00	3.00	1	1	4	0	2,750	40.0	1
410	1.00	2	2	1		2	23.00		2	27-Dec-2014	14	12	7	3.00	3.00	1	2	0	1	3,000	39.0	1
411	2.00	2	2	1		1	23.00		2	01-Oct-2014	28	18	3	3.00	3.00	2	1	3	0	2,600	40.0	2
413	1.00	1	1	2	21.00	2	60.00	60.00	2	28-Oct-2013	40	0	0	3.00	3.00	0	0	0	0	3,000	40.0	1
414	4.00	2	1	2	33.00	5	42.00	42.00	2	15-Dec-2015	14	5	3	1.00	1.00	1	1	3	0	3,000	40.0	2
415	0.00	1	1	2	21.00	4	22.00	22.00	2	08-Jul-2013	44	0	0	2.00	2.00	0	0	0	0	1,500	36.0	1
416	0.00	1	1	2	40.00	3	28.00	28.00	2	06-Nov-2014	27	0	0	3.00	3.00	0	0	0	0	3,200	32.3	1
417	1.00	1	1	2		2	23.00		1	23-Nov-2004	147	0	0	2.00	2.00	0	0	0	0	2,500	40.0	1
418	1.00	2	2	1	32.00	3	27.00	23.00	1	17-Feb-2008	108	6	5	1.00	1.00	1	1	5	0	2,500	40.0	1
419	0.00	1	1	2	31.00	3	23.00	23.00	2	12-Oct-2012	52	0	0	7.00	6.00	0	0	0	0	3,000	40.0	1
420	1.00	1	1	2	21.00	3	21.00		2	08-Aug-2010	78	0	0	3.00	3.00	0	0	0	0	1,900	38.0	1
421	0.00	1	1	2		2	23.00		1	03-Feb-2008	108	0	0	1.00	1.00	0	0	0	0	3,000	40.0	1
422	0.00	1	1	2		1	60.00		2	23-Apr-2014	35	0	0	2.00	2.00	0	0	0	0	3,000	40.0	2
423	4.00	2	1	1	21.00	3	21.00	21.00	2	12-Dec-2015	14	6	3	3.00	3.00	2	1	3	0	1,700	33.0	1
424	1.00	2	1	2	21.00	3	41.00	41.00	6	23-Mar-2013	47	8	5	2.00	2.00	1	1	5	0	3,500	38.0	1
425	1.00	2	1	2	21.00	3	21.00	21.00	2	01-Jan-2011	73	18	4	2.00	2.00	1	1	4	0	1,480	32.6	2
426	0.00	1	1	2	50.00	3	26.00	26.00	3	01-Nov-2005	136	0	0	6.00	5.00	0	0	0	0		40.0	1
427	0.00	1	2	2		1	23.00		2	28-Nov-2012	51	0	0	3.00	3.00	0	0	0	0	2,600	42.0	2
428	1.00	1	2	2	31.00	3	23.00	23.00	2	18-Jun-2012	56	0	0	3.00	3.00	0	0	0	0	2,500	40.0	2
429	0.00	1	1	2	21.00	3	21.00	21.00	2	09-Oct-2012	53	0	0	3.00	3.00	0	0	0	0	1,600	34.0	1
430	0.00	1	1	2	31.00	3	26.00	26.00	1	02-Sep-2013	41	0	0	5.00	4.00	0	0	0	0	3,500	40.0	2
431	1.00	1	1	2	40.00	3	60.00		4	20-Jul-2015	20	0	0	2.00	2.00	0	0	0	0	3,200	38.0	1
432	1.00	1	1	2	2,140.00	3	60.00		1	22-Apr-2013	47	0	0	2.00	2.00	0	0	0	0	3,500	40.0	1
433	0.00	1	1	2	31.00	3	26.00	26.00	3	16-Oct-2010	77	0	0	4.00	4.00	0	0	0	0	3,000	40.0	1
434	2.00	2	2	2		2	23.00		2	21-Nov-2015	21	1	3	3.00	3.00	2	1	3	0	3,000	40.0	1
435	1.00	2	2	1	32.00	3	23.00	23.00	2	11-Mar-2011	72	1	4	3.00	3.00	1	1	4	0	3,500	40.0	1
436	0.00	1	2	2	21.00	3	21.00	21.00	2	02-Oct-2014	29	0	0	3.00	3.00	0	0	0	0	1,600	34.0	2
437	2.00	2	2	1		2	23.00		2	03-Oct-2015	17	6	3	3.00	3.00	1	1	3	0	2,500	40.0	1
438	2.00	2	1	2		2	23.00		2	11-Mar-2010	84	12	7	1.00	1.00	1	2	0	1	3,250	42.0	1
439	0.00	1	1	2		2	23.00		2	15-Nov-2010	76	0	0	2.00	2.00	0	0	0	0	2,500	40.3	2
440	2.00	2	2	2	32.00	3	23.00	23.00	3	15-Mar-2014	35	12	3	3.00	3.00	1	1	3	0	3,500	40.0	1
441	2.00	2	1	2		1	21.00		3	02-Sep-2015	18	6	3	7.00	6.00	1	1	3	0	2,160	40.0	1
442	0.00	1	1	2		1	21.00		2	24-Jan-2015	25	0	0	2.00	2.00	0	0	0	0	1,330	28.0	1
443	2.00	2	1	1	32.00	3	21.00	21.00	2	25-Sep-2015	18	12	3	3.00	3.00	2	1	3	0	1,100	37.0	1
444	3.00	2	1	2	31.00	3	23.00	23.00	2	04-Jun-2010	81	60	7	7.00	6.00	2	2	7	1	3,700	40.0	2
445	1.00	1	1	2	32.00	4	22.00	2,223.00	3	08-Jul-2014	32	0	0	2.00	2.00	0	0	0	0	1,750	40.0	1
446	0.00	1	1	2	21.00	3	23.00	23.00	2	05-Aug-2013	43	0	0	1.00	1.00	0	0	0	0	2,100	40.0	1
447	2.00	2	2	2		2	26.00		3	04-Oct-2006	125	15	4	7.00	6.00	1	1	4	0	2,400	40.0	1
448	2.00	2	1	2	21.00	3	23.00		2	10-Dec-2010	75	6	4	3.00	3.00	1	1	4	0	3,500	40.0	1
449	0.00	1	1	2	21.00	5	22.00	22.00	2	21-Apr-2012	47	0	0	3.00	3.00	0	0	0	0		28.0	1
450	2.00	2	2	2	21.00	3	23.00	2,324.00	3	12-Oct-2014	29	1	5	2.00	2.00	2	1	5	0	3,000	38.0	2
451	0.00	1	1	2	21.00	3	60.00		2	08-Mar-2011	72	0	0	1.00	1.00	0	0	0	0	2,500	40.0	2
452	2.00	2	2	2	21.00	3	23.00	23.00	2	02-Apr-2015	23	12	3	3.00	3.00	1	1	3	0	2,500	40.0	1
453	0.00	1	1	2	21.00	3	23.00	23.00	2	23-Dec-2014	27	0	0	2.00	2.00	0	0	0	0	2,500	34.0	1
454	1.00	2	1	2	2,140.00	3	23.00	23.00	2	30-Jun-2015	21	3	1	7.00	6.00	1	1	1	0	2,500	36.0	2
455	4.00	2	2	2		2	23.00		2	14-Dec-2012	52	12	1	3.00	3.00	1	1	1	0	2,500	40.0	2
456	2.00	1	1	2	21.00	3	21.00	2,123.00	2	17-Jul-2004	152	0	0	3.00	3.00	0	0	0	0	1,600	28.0	1
457	1.00	1	1	2	31.00	3	23.00	23.00	2	06-Apr-2010	83	0	0	3.00	3.00	0	0	0	0	2,200	41.0	2
458	2.00	2	1	2		2	28.00		1	15-Aug-2014	31	6	4	1.00	1.00	1	1	4	0	2,500	40.0	1
459	1.00	2	1	2		1	21.00		2	26-Nov-2015	16	6	7	7.00	6.00	1	2	0	1	1,400	32.0	1
460	0.00	1	1	2	33.00	3	23.00	23.00	2	06-Feb-2006	124	0	0	1.00	1.00	0	0	0	0		40.0	2
461	3.00	1	1	2	31.00	3	23.00	23.00	2	11-Mar-2014	36	0	0	3.00	3.00	0	0	0	0	2,500	40.0	1
462	1.00	2	1	2	32.00	3	23.00	23.00	2	17-Jun-2011	69	24	4	7.00	6.00	1	1	4	0	3,500	40.0	1
463	1.00	1	1	2	21.00	3	29.00	29.00	2	15-Nov-2014	29	0	0	1.00	1.00	0	0	0	0	2,500	36.0	1

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2	2	1	1	5	0	0	0	0	0	0	2	2	2	2	2	42.2	9.8	82.0	0.0	-1.23	-2.49	-2.93	-0.85	-4.77	-9.00	60	2
2	2	1	1	4	6	4	0	0	36	108	7	6	6	0	5	41.5	16.2	114.0	15.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2
2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	45.2	11.5	94.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	1
2	2	1	1	5	10	15	0	0	10	11	5	6	12	7	5	47.0	14.9	94.0	16.7	1.07	0.95	0.38	1.01	-1.40	0.96	50	2
1	1	1	1	6	12	15	24	30	30	10	12	60	60	60	60	46.5	15.8	106.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	30	1
2	2	1	1	3	7	12	36	36	24	18	12	36	36	36	36	47.0	16.0	99.0	16.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	31	2
1	1	1	1	3	4	11	13	24	26	18	12	18	36	9	12	46.0	10.6	85.0	0.0	-1.01	-2.03	-2.39	-0.71	-2.16	-9.00	20	1
1	1	1	1	3	3	7	11	12	5	10	9	12	12	8	9	43.3	0.0	0.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-2.31	40	1
2	2	1	1	4	7	12	19	0	7	12	10	6	10	7	5	44.5	17.3	84.0	19.0	5.20	3.80	-0.15	5.28	-2.41	3.10	30	2
2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	42.0	10.5	82.0	14.0	-0.38	-1.50	-2.28	-0.06	-4.71	-1.10	60	1
2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	38.2	8.0	73.0	13.5	-1.54	-2.44	-2.77	-1.06	-6.70	-1.16	60	2
2	2	1	1	3	4	24	0	0	30	24	7	18	24	12	18	46.7	11.1	90.0	13.6	-1.74	-2.57	-2.55	-1.33	-2.17	-1.98	50	2
2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.0	19.0	0.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
2	2	1	1	4	6	0	0	0	24	12	3	3	9	7	5	46.8	13.0	93.0	15.0	-0.40	-1.67	-2.41	-0.08	-2.27	-0.85	40	2
2	2	1	1	6	18	36	60	60	60	60	12	30	36	24	36	49.0	26.8	131.0	20.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	1
2	2	1	1	0	30	60	60	0	60	0	2	2	2	2	2	46.5	15.6	115.0	13.2	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2
2	2	1	1	0	5	12	0	0	24	24	5	6	9	7	12	45.5	9.9	78.0	14.2	-0.17	-2.01	-3.61	0.54	-2.18	-0.93	50	2
1	2	1	1	3	5	7	12	24	8	12	12	36	36	24	36	47.0	10.9	83.0	13.5	-0.16	-2.36	-3.82	0.41	-1.77	-1.98	20	2
2	2	1	1	3	18	36	60	60	36	12	12	24	36	24	24	48.5	19.4	116.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2
2	2	1	1	3	6	18	0	0	18	18	5	12	12	9	9	46.2	9.4	81.0	12.8	-1.52	-2.58	-2.60	-1.15	-1.72	-2.32	40	2
2	2	1	1	0	0	0	0	0	0	0	1	1	1	1	1	44.6	12.9	99.0	15.2	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	1
2	2	1	1	4	3	0	0	0	8	0	3	6	6	3	5	43.2	8.1	75.0	13.0	-1.92	-1.84	-0.99	-1.79	-2.51	-1.58	60	2
2	1	1	1	12	18	36	0	0	36	0	6	9	9	7	5	45.3	11.0	84.0	15.5	0.02	-2.27	-3.66	0.38	-2.50	-0.27	40	2
2	2	1	1	4	0	0	0	0	0	0	2	2	2	2	2	41.3	8.0	77.5	13.0	-2.78	-3.90	-3.93	-2.13	-5.30	-2.12	60	2
2	2	1	1	12	13	30	0	0	12	0	12	6	9	7	5	48.0	21.1	117.0	18.8	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2
2	2	1	1	4	8	0	0	0	14	0	3	3	3	0	3	44.3	8.6	81.0	0.0	-2.72	-3.30	-2.67	-2.47	-3.06	-9.00	60	2
2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	39.5	10.7	80.0	15.2	0.65	-1.25	-3.01	1.03	-5.91	-0.03	60	1
2	2	1	1	6	18	18	0	0	30	24	5	9	9	9	12	47.2	13.4	90.0	16.0	0.64	-0.93	-2.41	1.01	-1.77	0.09	50	2
2	2	1	1	3	3	12	0	0	0	0	3	2	6	1	3	41.7	8.1	73.0	0.0	-0.83	-1.27	-1.44	-0.58	-2.80	-9.00	20	2
2	2	1	1	4	6	18	0	0	18	18	7	18	30	12	18	48.0	13.1	93.0	15.0	-0.10	-1.17	-1.89	0.06	-0.76	-0.77	40	2
2	2	1	1	5	12	0	0	0	0	18	2	4	5	0	3	47.8	11.2	85.0	14.5	-0.33	-1.21	-1.81	-0.09	-0.65	-0.75	60	2
2	2	1	1	5	6	12	24	0	72	48	10	24	60	24	36	52.8	27.4	129.0	19.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2
2	1	1	1	5	8	9	12	13	30	0	24	36	9	36	36	46.6	18.7	119.5	15.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	20	2
2	2	1	1	0	0	0	0	0	0	0	2	0	9	0	3	47.5	11.8	91.0	13.5	-1.18	-2.92	-3.57	-0.65	-1.99	-2.30	60	2
2	2	1	1	6	24	48	0	0	36	27	5	24	60	9	36	48.3	13.0	103.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	51	2
2	2	1	1	6	24	30	36	36	24	48	24	24	12	30	36	47.7	18.7	118.5	13.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	30	2
2	2	1	1	3	4	24	0	0	9	24	5	24	12	24	12	46.8	11.4	85.5	15.0	0.06	-1.37	-2.43	0.32	-1.11	-0.44	40	2
2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	43.8	10.2	80.0	16.0	-0.29	-0.04	0.48	-0.42	-2.25	1.08	60	2
2	2	1	1	3	4	24	0	0	11	39	5	24	12	12	24	47.3	14.8	101.5	15.5	-0.63	-0.73	-0.52	-0.64	-1.97	-0.48	40	2
2	2	1	1	3	6	18	18	48	8	12	12	24	18	24	12	47.2	22.7	111.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	1
2	2	1	1	6	8	0	0	0	36	60	5	6	30	7	5	51.5	27.8	130.0	22.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	1
2	2	1	1	0	30	0	0	0	24	0	3	4	8	4	4	42.0	12.0	95.0	15.2	-1.53	-2.45	-2.33	-1.35	-5.28	-0.86	60	2
2	2	1	1	4	12	30	36	0	30	30	10	24	36	12	30	46.0	14.0	98.0	16.0	-1.53	-2.82	-2.87	-1.32	-5.46	-1.02	51	2
2	2	1	1	4	8	12	12	29	12	10	12	24	30	12	24	47.7	14.4	98.0	15.2	-0.07	-1.18	-1.84	-0.03	-1.33	-0.91	50	2
2	2	1	1	8	24	30	36	0	24	36	9	18	10	9	9	48.2	11.8	93.0	13.5	-1.30	-1.86	-1.68	-1.17	-0.54	-1.97	10	1
2	2	1	1	0	0	0	0	0	0	0	2	1	3	1	3	46.0	9.0	76.0	13.5	-0.92	-2.01	-2.81	-0.34	-1.22	-1.30	40	1
2	2	1	1	5	8	42	0	0	30	36	5	6	9	7	9	47.7	13.3	97.0	17.5	-0.98	-1.52	-1.50	-0.84	-1.67	1.00	40	2
2	2	1	1	0	36	36	0	0	18	48	5	9	12	7	5	49.5	12.8	104.0	13.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	10	1
2	2	1	1	0	0	0	0	0	0	0	1	0	0	0	0	40.6	8.5	80.5	12.8	-2.72	-1.87	0.29	-3.00	-4.82	-1.84	60	2
2	2	1	1	0	0	0	0	0	0	0	2	1	0	0	0	45.0	0.0	0.0	15.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
2	2	1	1	5	7	0	0	0	12	18	3	9	18	12	9	48.0	13.1	92.0	14.5	0.11	0.32	0.32	0.13	0.10	-0.64	50	2
2	2	1	1	0	0	0	0	0	0	0	2	0	6	1	1	40.2	7.9	74.5	12.3	-2.13	-2.79	-2.67	-1.66	-5.34	-2.41	60	2
2	2	1	1	4	6	8	18	24	36	0	24	9	9	12	30	46.0	20.4	122.5	16.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	20	2
2	2	1	1	4	9	10	12	18	8	7	12	36	36	36	30	49.7	16.7	115.0	15.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	40	2
2	2	1	1	6	24	0	0	0	0	0	2	2	2	2	2	44.6	14.8	94.0	17.0	0.99	0.26	-0.75	1.07	-3.42	0.96	60	2
2	2	1	1	0	0	0	0	0	16	0	2	2	2	2	2	43.5	9.4	77.0	14.5	-0.60	-1.41	-2.09	-0.17	-2.97	-0.32	10	1
2	2	1	1	6	13	18	0	0	18	24	5	24	12	12	30	46.7	9.8	82.0	13.8	-1.28	-2.14	-2.30	-1.01	-1.29	-1.29	40	2
2	2	1	1	0	0	0	0	0	0	0	2	2	2	2	2	38.5	7.1	73.5	0.0	-3.25	-3.74	-3.15	-2.78	-6.66	-9.00	60	2
2	2	1	1	6	7	12	60	0	12	18	7	12	12	12	18	49.2	16.4	112.5	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
2	2	1	1	4	6	12	30	0	24	18	9	9	12	12	12	43.0	9.9	87.5	12.5	-2.64	-2.79	-1.92	-2.41	-4.38	-2.86	40	1
2	2	1	1	3	3	12	18	18	12	12	15	9	24	12	12	50.8	11.2	95.0	12.5	-2.78	-2.68	-1.58	-2.57	0.58	-3.12	30	2
2	2	1	1	0	9	20	24	36	0	0	12	9	10	0	5	47.0	23.0	130.0	16.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	10	1
2	2	1	1	0	48	0	0	0	48	48	3	6	18	0	6	45.0	13.7	101.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
2	2	1	1	4	10	12	42	0	12	24	12	24	36	60	36	52.5	14.9	97.0	16.0	0.44	-1.49	-2.84	0.63	1.21	-0.35	51	2
2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	42.0	11.7	14.3	91.0	-0.95	-0.57	0.05	-0.97	-4.17	-0.80	40	2
2	2	1	1	3	5	9	12	18	18	24	24	60	60	60	60	50.0	23.5	116.0	0.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	20	1
2	2	1	1	6	12	0	0	0	0	18	2	2	3	1	1	42.5	9.8	79.0	13.7	-0.61	-1.88	-2.81	-0.09	-4.20	-1.29	60	1
2	1	1	1	2	6	10	16	21	10	18	20	15	12	18	16	46.5	11.6	84.0	14.5	0.35	-0.81	-1.95	0.63	-1.53	-0.71	40	1
2	2	1	1	6	0	0	0	0	0	0	3	4	3	4	3	41.7	7.5	74.0	12.5	-2.01	-3.09	-3.09	-1.49	-3.60	-1.98	60	2
2	2	1	1	4	5	15	0	0	17	12	8	7	10	10	8	42.2	11.7	89.5	0.0	-0.93	-2.90	-3.79	-0.36	-5.55	-9.00	50	2
2	2	1	1	12	36	0	0	0	0	0	4	4	3	6	4	49.8	22.6	0.0	19.5	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	60	2
2	2	1	1	5	6	9	18	0	24	18	7	36	36	12	24	49.5	15.7	103.0	16.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	50	2
2	2	1	1	4	7	10	15	20	12	18	24	24	16	18	24	47.0	13.8	91.0	15.0	0.78	0.14	-0.78	0.91	-1.49	-0.46	20	2
2	2	1	1	0	6	14	0	0	0	0	3	0	5	7	3	39.5	8.4	75.5	13.5	-1.62	-2.03	-1.87	-1.29	-5.73	-1.17	60	2
2	2	1	1	4	6	7	24	36	12	48	12	12	18	12	30	50.6	27.4	130.0	19.0	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	20	2
2	2	1	1	5	9	18	0	0	24	30	9	24	18	12	24	47.2	11.9	86.0	14.2	0.16	-1.62	-3.01	0.61	-1.63	-1.33	51	2
2	1	1	1	4	0	0	0	0	0	0	3	4	3	4	3	49.2	12.2	93.0	14.7	-9.00	-9.00	-9.00	-9.00	-9.00	-9.00	10	1
2	2	1	1	4	9	18	0	0	0	12	10	12	8	12	8	47.8	14.9	94.0	16.3	1.07	1.14	0.73	0.97	-0.71	0.72	20	2

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1	1	76	64	88	46	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
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